14.—*On Some Ectoparasites in the South African Museum, Cape Town.* —By James Waterston, B.D., B.Sc.

(Plates XXV. and XXVI.)

The present paper owes its inception to a correspondence between the writer and Dr. Péringuey, who, in 1912, submitted for identification a small but important collection of ectoparasites belonging to the South African Museum. A valuable portion of this material consisted of *Mallophaga*, taken mainly on tubinarial hosts in Tristan d'Acunha by P. Bonomi in 1904. But the collection as a whole proved so interesting that Dr. Péringuey arranged for a more systematic examination of birds and mammals in the taxidermist's room of the Museum. Thus during the last two years there have accumulated in all some 5,000 examples belonging to 80–90 species of the orders *Siphonaptera*, *Anoplura*, and *Mallophaga*, and the gathering is still in progress. Partly for this reason and partly because doubt still attaches to a few determinations, the whole collection is not now reported upon. The residue will form the nucleus of a second instalment to be published whenever sufficient material has been brought together. Ultimately also Dr. Péringuey hopes there may be evoked sufficient interest in the *Mallophaga* of South Africa to justify a detailed account with figures of each species. At present one must be content to notice fully only those forms that appear to be new, and in other cases to add critical remarks when necessary.

Only two notes of a general nature require to be added :—

(1) The writer has had impressed upon him forcibly, in going over the *Mallophaga*, the cosmopolitan distribution of many species of that order. This fact has been often before commented upon, but it is certainly vividly illustrated when, as has happened in the writer's experience, to one collecting *Mallophaga* from a bird shot at one's door in Shetland, there arrives a consignment of precisely

the same species from South Africa, but from a different host. The greatest care, therefore, requires to be exercised in erecting new species.

Where the numbers of a species have permitted dissections have been made to facilitate examination of certain internal features—chiefly in the genitalia—on which experience has shown reliance may be placed for specific determinations. In this way one not infrequently finds that the claims of an insect to specific rank vanish, but conversely the critical test of the genitalia show that many so-called varieties are distinct species. There is often a wonderful resemblance in general facies, colour, dimensions, and chaetotaxy in the latter cases, and it is never really safe to give an opinion as to the status of two closely similar Philopterid forms from different hosts till the ♂ genitalia have been dissected.

(2) As every student of the *Mallophaga* knows, the phenomenon of "straggling" exhibited in this order affords most fascinating problems. It may seem that many of the following records are unusual, but much weight cannot be attached to such occurrences owing to the conditions under which the bulk of the collections have been made. When, from notes supplied by Dr. Péringuey, it is evident that the parasites of one host have been accidentally transferred to another in the taxidermist's room, the labelling has been corrected without remark.

No special order has been followed for the *Siphonaptera* and the *Anoplura*, as there is comparatively little material (10 spp. in all) from these groups. The *Mallophaga* have been arranged mainly according to Kellogg in Wytsman's Genera Insectorum, 66 me Fascicule "*Mallophaga*" (1908). At the same time most of Mjöberg's (1910) sub-divisions into families have been adopted. The species of *Lipeurus* recorded in the following pages will ultimately occupy several genera, but at present it seems premature to essay the difficult task of division.

We desire to thank the Carnegie Research Trust for the use of a dissecting microscope. Professor V. L. Kellogg, Stanford University, Cal., has supplied valuable material for comparison, and to him also we would express our indebtedness. In one or two special points—particularly in verifying certain references which could not be attempted by one so far from the centre—the assistance of Mr. B. F. Cummings, British Museum, and the Hon. N. Charles Rothschild, M.A., has been invoked and cordially given. All these friends we have pleasure in thanking now.

SIPHONAPTERA.

Gen. PULEX, L.

Pulex, Linnæus, Syst. Nat. Ed. x. p. 614 (1758).

Pulex irritans, L. (1758).

Pulex irritans, Linnaeus, Syst. Nat. Ed. x. p. 614, No. 1 (1758).

♂. *Proteles cristatus.*

5 ♂ ♂, ♀. "Alleged to have come off a field mouse, Cape Town."

Jordan and Rothschild (Revis. Non-combed Eyed *Siphonaptera*, p. 12, 1908) have already recorded this cosmopolitan satellite of man from Deelfontein (Cape Colony) off *Felis caracal* and *Tinamus* spec.; also from Kingwilliamstown, where it occurs freely in Kaffir kraals (Godfrey).

Gen. ECHIDNOPHAGA, Olliff.

Echidnophaga, Olliff, Pr. Linn. Soc. N.S.W. (2) i. p. 172 (1886).

Echidnophaga gallinaceus, Westwood (1875).

Sarcopsyllus gallinaceus, Westwood, Ent. Mo. Mag. xi. p. 246 (1875).

2 ♀ ♀. *Homo.* Taxidermist's room, Cape Town Museum.

About 50 examples, many mutilated. *Strix flammea*, in box which had been occupied by a "dassie" (*Procavia capensis*).

20 ♀ ♀. On Bluebok (*Cephalophus monticola*).

50 ♂ ♂, 10 ♀ ♀. Domestic Fowls.

10 ♂ ♂, 35 ♀ ♀. Dog. Livingstone, N.W. Rhodesia.

This pest is apparently common over South Africa, occurring on a variety of hosts, but particularly on animals of the farmyard—fowls, ducks, dogs, and cats, rats, and sometimes on man. Dr. Péringuey remarks that the fleas taken at Livingstone were "making the dog's life a perfect misery." For some S.A. records, see Jordan and Rothschild, Revis. of the Sarcopsyllidæ, p. 54, Liverpool, 1906.

Echidnophaga larina, Jord. and Rothsch. (1906).

Echidnophaga larina, Jordan and Rothschild, Revision of the Sarcopsyllidæ, Thomps. Yates and Johnst. Lab. Report, vol. vii. pt. i. pp. 49–51, pl. i. f. 12, pl. ii. f. 18, pl. iii. f. 25 (1906).

2 ♂ ♂, 8 ♀ ♀. *Orycteropus capensis* (Ant-eater).

Mr. Rothschild has kindly confirmed this identification. *E. larina* has occurred in Cape Colony, German East Africa, Somaliland, and

Abyssinia. For detailed records see Jordan and Rothschild, *loc. cit.* p. 51, also by the same authors Kat. der Siphonapt. des Königl. Zoolog. Mus. in Berlin. Novitates Zoologicae, vol. xviii. p. 61, June, 1911.

Unlike *E. gallinaceus* this species occurs only on mammals.

Gen. CTENOCEPHALUS, Kolenati.

Ctenocephalus, Kolenati, Fauna d. Altvat. p. 65 (1859).

Ctenocephalus canis, Curt. (1826).

Pulex canis, Curtis, Brit. Ent. iii. No. 114, figs. A–E fig. 8 (1826).
6 ♂ ♂, 13 ♀ ♀. *Cephalophus monticola.*

Ctenocephalus felis, Bouché (1835).

Pulex felis, Bouché, Nova Acta Acad. Leop. Carol. xvii. i. p. 505 (1835).

3 ♀ ♀. *Homo.* Taxidermist's Room, Cape Town Museum.
♂, 3 ♀ ♀. *Cephalophus monticola.*

Gen. DINOPSYLLUS, Jordan and Rothschild.

Dinopsyllus, Jordan and Rothschild, Zool. Novit. xx. 3. p. 561 (1913).

Dinopsyllus ingens, Rothsch. (1900).

Typhlopsylla ingens, Rothschild, Ent. Rec. xii. p. 37, pl. 2, f. 4, 1900.
4 ♂ ♂, ♀. "Probably from porcupine."

A full revision of the known species of *Dinopsyllus*—a genus requiring careful discrimination—will be found in Novitates Zoologicae, vol. xx. Oct., 1913, p. 561 ff. *D. ingens* is the most isolated of the species, as the vertical comb along the front edge of the antennal groove is absent or vestigial. The 5th tarsal segment bears 5 pairs of bristles also, instead of the normal 4. But Dr. Jordan and Mr. Rothschild do not think it is advisable at present to place *ingens* in a separate genus.

ANOPLURA.

Gen. POLYPLAX, Enderlein.

Polyplax, Enderlein, Zool. Anz. xxviii. p. 142 (1904).

Polyplax otomydis, Cummings (1912).

Polyplax otomydis, Cummings, Bull. Ent. Res. vol. iii. pp. 395, 397, fig. 2 (1912).

32 ♂ ♂, 60 ♀ ♀, 32 imm. *Otomys brantsi luteolus.*

We believed these to represent a new species, and were about to draw up a description when our friend's excellent and beautifully illustrated paper came to hand. Mr. Cummings notes that *P. otomydis* stands close to *P. suturalis*, Osborn (Bull. 5. N.S., U.S. Dept. Agric. p. 185, 1896). It is distinguished, however, by its larger size, the shape of the abdomen, etc. Cummings' types in Brit. Mus. Coll. (♀ ♀ only) were taken on *Otomys irroratus tropicalis*, Thos., in British East Africa, northern slopes of Mt. Kenya, 7,200 ft. (S.A. Neave). The insect, however, does not appear to vary.

One of the above ♂ ♂ has been added to the national collection, from which a duplicate ♀ has been presented by the trustees to the S.A. Museum.

Gen. LINOGNATHUS, Enderlein.

Linognathus, Enderlein, Zool. Anz. xxix. p. 194 (1905).

Linognathus tibialis, Piaget (1880).

Haematopinus tibialis, Piaget, Les Pédiculines, p. 646, pl. lii. f. 8 (1880).

L. tibialis euchore, var. nov.

44 ♂ ♂, 156 ♀ ♀. *Antilope euchore.*

Although evidently belonging to the *tibialis* type of *Linognathus* these specimens seem worth separating as a variety of Piaget's unfortunately not too clearly defined species. We have thought it best to describe this form with some detail, indicating where it seems to differ from Piaget's description of his types which were taken from *Antilope maori* (Jardin Zool. de Rotterdam). In the same "Zoo" Piaget also found two forms which he considered to be varieties of his *tibialis*, viz.:—

1. var. *antennata* on *Antilope*, sp.
2. var. *appendiculata* on *Antilope subgutturosa.*

Mr. Cummings writes that he has not yet seen what he considers to be typical *tibialis*.

We have evidently on *Antilope*, spp., a series of slightly differing forms whose precise status is probably to be determined only by a critical examination of the chaetotaxy and ♂ genitalia.

♂. *Head.* Before antennae, moderately produced, triangular,

with slightly blunt apex. About half a dozen minute bristles round mouth. One short hair at side of head anteriorly, a second midway between oral edge and antennae, and a third slightly behind the second. At $\frac{1}{3}$ from oral edge and line connecting the antennae row of 4 short hairs dorsally placed. At $\frac{1}{3}$ from antennae, but below, a row of 4 hairs, of which the middle two are long. Still below and symmetrically placed with the 2 hairs just mentioned there are 2 long hairs. Row of 4 short dorsal hairs at level of antennae, viz., 1 at anterior edge of 1st antennal joint and

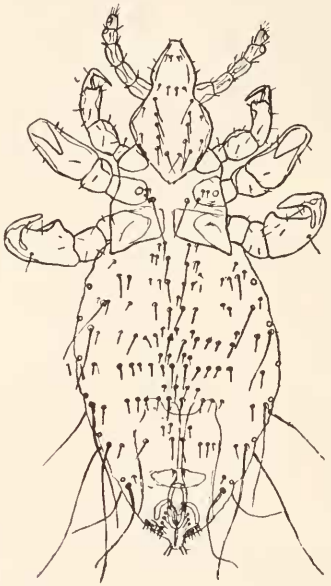


Fig. 1.—L. tibialis euchore ♂.

1 medianly at side of sucking apparatus. On the dorsum of the head, between the antennae and the angular occiput, a double row of long, strong, median hairs—6 pairs in all, of which the last pair are displaced more into the middle line. Between each row and the edge, and nearer the latter, an anterior and a posterior short bristle, *i.e.* 4 in all. The lateral bands of the head are elongate before the antennae—broad near the base of the 1st joint, and coming to a fine point near the oral edge, where there is a clear region. Behind the antennae the bands are broad above, slightly narrower beneath, where they are sharply excised medianly. Antennae rather long; 5-jointed, last 2 joints with sensoria.

Thorax. Sub-quadrangular, anteriorly angularly emarginate, 3 minute hairs near spiracle, and inside and posterior to these the usual pair of long hairs, under surface entirely bare.

Abdomen. Without distinct segmentation. Integument rugose. The limits of the segments, however, may be fairly judged by the spiracles. In general each tergite bears a row of hairs, of which the median pair and one below the spiracle on each side are stronger. The spiracular hair is wanting on segment 4. Before the main row of hairs there is another of fewer and weaker elements. The chaetotaxy of tergites I.–VII. is :—

Tergites.		I.	II.	III.	IV.	V.	VI.	VII.
1st row double ...	(*a*)	4	—	—	—	—	—	—
	(*b*)	6	4	4	4	4	4	2
2nd row		12	10–12	14	13	13	10	4

On the 8th and 9th tergites there are altogether some 26 small hairs disposed as in figure.

Under surface. First sternite 2 rows only, 8th and 9th bare.

Long sub-spiracular hairs occur only on sternites 5–7.

In the middle sternites 2–7 agree closely with the corresponding tergites.

The genital mark is dark, quadrate, 2 slight blunt anterior cornua and a clear post-median oval space. Dorsally there are on each side of the genital opening two chitinized plaques—the anterior curved, the posterior straight and almost at right angles to the first. The genitalia reach back to the level of the 4th pair of stigmata.

The anterior pair of legs are much slighter than the posterior pair whose tibiae are unusually thick.

♀. Similar in chaetotaxy and shape to ♂, but with a more pointed head before the antennae. Abdomen more truncated posteriorly. Gonopods with 8–10 terminal bristles, of which one is very strong. Genital mark like a hand looking-glass in shape. 9th sternite not markedly chitinized, with two slanting edges towards the gonopods. These edges are fringed with soft hairs. On the posterior edge there are a few backwardly directed hairs. The last segment is almost entirely surmounted by a chitinous ring. Piaget's description of the chaetotaxy is too incomplete, and his figure of *L. tibialis* too diagrammatic for comparison. From the measurements one sees that the present variety is a broader insect in the head, thorax, and abdomen. It is also slightly larger in the ♂, but the ♀ appears to be shorter. We do not understand some of Piaget's figures.

Measurements of L. TIBIALIS EUCHORE.

		♂			♀	
		Length.	Breadth.		Length.	Breadth.
Head		·357	·257		·400	·271
Thorax		·242	·357		·257	·385
Abdomen		·900	·614		1·057	·714
	Total ...	1·46 mm.		Total	1·7 mm.	
Antennae	1	·053	·063		·060	·063
	2	·076	·046		·070	·050
	3	·063	·046		·053	·046
	4	·043	·043		·043	·043
	5	·040	·033		·043	·033

LINOGNATHUS PILIFERUS, Burm. (1888).

Pediculus piliferus, Burmeister, Gen. *Rhynchota*, N., 13 (1838).

10 ♀ ♀, 2 mm. Dog. Cape Town, 28 : vi : 11. R. Lightfoot, coll.

GEN. HYBOPHTHIRIUS, Enderlein.

Hybophthirius, Enderlein, Jena Deutschr. xiv. p. 79 (1909).

HYBOPHTHIRIUS NOTOPHALLUS, Neumann (1909).

Haematopinus notophallus, Neumann, Jahrb. des Nassauisch. Vereins f. Naturk. in Wiesbaden, p. 2 (1909).

37 ♂ ♂, 41 ♀ ♀, 45 mm. and 25 ova. *Orycteropus capensis* (Ant-eater).

Bruce F. Cummings states (Bull. Ent. Res. vol. iv. p. 44, 1913), on the authority of Gustav Fischer, that *notophallus*, Neumann, has one month's priority over *orycteropodis*, Enderlein, who, however, rightly founded a new genus for this extraordinary louse. With his customary kindness, Mr. Cummings has ascertained from the publisher (J. F. Bergman in Wiesbaden) that the Nassauische Jahrbucher (containing W. Neumann's paper) Jahrg. 62 (1909)—"Am 5th November 1909 Zur Versendung gelangte." There is no date on the Journal itself except the year.

MALLOPHAGA.

A considerable literature exists dealing incidentally or more specially with the *Mallophaga* of Africa. In the great Monographs of Giebel (1874), Piaget (1880–5), and Taschenberg (1881) many species are described from African hosts. More recently Enderlein (1909), Glinkiewicz (1912), Harms (1912), Cummings (1912), Mjöberg (1910–11), Kellogg and Paine, Neumann, and others

have reported on collections made in certain regions of the continent. Any necessary references are given under the species treated in the following pages. It has not seemed advisable to attempt to offer a complete Bibliography.

As the genitalia ♂ have been referred to frequently, the descriptive terms used may be briefly explained. The sexual apparatus of the ♂ in what we believe to be its primitive Philopterid form consists of 9 parts in two regions. These are illustrated in the figures of *N. opacus* and *N. macrocephalus*. (Pl. XXV., figs. 2–4.)

1. There is a broad laterally thickened chitinized lamina, which is wholly internal and to which numerous strong muscles are attached.

2. Externally there are 6 parts placed symmetrically about the tubular penis and one additional below. This last is often hard to make out, and may look like a swollen base to the penis. The penis, however, seems to take constantly the form of a simple tube. Snodgrass (1899) has already figured and described several examples of this type, and Mjöberg (1910) refers constantly to the genitalia. But it has not yet been sufficiently grasped that the apparatus gives by far the best characters for the discrimination of species. Snodgrass calls the portion inside the abdomen the "internal plate"; Mjöberg speaks of the "basal plate," a name we personally prefer. To the distal end of the plate at each side, and articulating distinctly with the plate, are two broad curved chitinous blades provided with a sub-terminal outwardly directed lateral hair and one median or post-median ventral hair. These "blades" Mjöberg calls "paramera." The paramera can move freely upwards, and may be completely reversed to lie parallel with tergites 7–9. They can also move scissor-like towards one another. As no names appear to have been given to the parts within the area circumscribed by the paramera, we propose the following:—

(*a*) Endomera for the two appendages lying next the paramera. The endomera are feebly movable distally from one another, but are fused proximally. The paramera articulate both with the endomera and the basal plate. The endomera bear, generally medianly or post-medianly and sometimes laterally, ventral hairs whose position may have specific value.

(*b*) Appearing inside the endomera and at either side of the penis are two smaller *telomera*. They are best seen in those species where they project far beyond the endomera.

(*c*) The hypomeron is the unpaired process beneath the penis.

(*d*) The *endomera* are above the penis. The *telomera* alongside and above the penis and the *hypomeron* below. All five parts may be

collectively referred to as the *mesosome*. It is sometimes convenient to do so when the parts in association have a characteristic shape. It should be noted that occasionally the telomera are parted by the penis, which appears above them, also that the penis is enveloped proximally by the bases of the telomera and by the endomera as well. The above notes of position refer to the free distal portion of the penis.

Sub-Order ISCHNOCERA.

Family DOCOPHORIDAE.

Gen. DOCOPHORUS, Nitzsch.

Docophorus, Nitzsch, in Germar's Mag. f. Insekt. vol. 3, p. 289 (1818).

Docophorus bassanae, Denny (1842).

Docophorus bassanae, Denny, Monogr. Anopl. Brit. p. 110, pl. vi. f. 3, pl. viii. f. 3 (1842).

This represents the ♀ (ad. and imm.) of *Lipeurus pullatus*, N.

We mention the form simply from its occurrence in Kellogg's "List." For discussion see Waterston, Proc. Roy. Phys. Soc. Edin., vol. xviii. No. 4, p. 248 (1912).

Docophorus bifrons, N.

Docophorus bifrons, Nitzsch, in Giebel, Ins. Epiz. p. 61 (1874).

♂, ♀, 2 imm. examples. *Merops apiaster* (European Bee-eater).

♀, imm. *Merops apiaster*. Philipstown, C.P.

Docophorus cordiceps, Piaget (1880).

Docophorus cordiceps, Piaget, Les Pédiculines, p. 80. pl. vi. f. 2 (1880).

On three species of *Aegialitis* as follows:—

♂. *A. marginata*, 1912.

7 ♂♂, 5 ♀♀. *A. marginata*. Sept., 1913.

♂, 13 ♀♀, imm. *A. pecuaria*. 1912.

8 imm. *A. pecuaria*. 1912.

3 ♂♂, 3 ♀♀, imm. *A. tricollaris*. Sept., 1913.

Our present impression is that the variation exhibited by this species is mainly in dimensions. The above examples belong to the slightly smaller form found regularly on *Aegialitis* spp. and to it possibly Giebel's name *semivittatus* should be applied. Typical *cordiceps*, P., occurs, we think, on *Totanus*, *Tringa*, and *Strepsilas*,

while on *Vanellus* there is a larger race for which *temporalis*, G., may meantime be retained. We have looked hitherto in vain for structural differences, but we have not yet had an opportunity of dissecting var. *temporalis*. We have, in fact, seen but one adult ♂ of this form. The problem of separating the races of *cordiceps* is complicated not merely by the evident fineness of the distinctions (if they really exist) but also by the sociable nature of the hosts, which facilitates transmission of the parasites in a confusing way.

Docophorus cursor, N.

D. cursor, Nitzsch, in Giebel, Ins. Epiz. p. 75, pl. x. figs. 5, 6 (1874).

3 ♂ ♂, 3 ♀ ♀. *Bubo capensis.*

15 ♂ ♂, 14 ♀ ♀, 10 imm. *Bubo maculosus* (Spotted Eagle Owl). Philipstown, C.P.

With regard to the *Docophori* of the owls, we find ourselves at present in substantial agreement with the position taken up by Professor Kellogg in a suggestive short paper in Science, N.S. vol. xxxvii. No. 943, p. 154 (1913). We have seen *Docophori* from about a dozen species of owl from various localities—Canada, Iceland?, Great Britain, East Prussia, and South Africa—and think with Kellogg that three types—*celebrachys*, N., *cursor*, N., and *rostratus*, N.—will cover most of the species (about a dozen) hitherto reported from owls. This at least should be a satisfactory position to adopt until the ♂ genitalia have been compared.

The case of the owl *Docophori* is, however, but a special instance of a condition occurring frequently among the *Mallophaga*, viz. the attachment of what seems, superficially at least, the same species (or group of species) to similar hosts (*i.e.* of the same or allied genera) over a wide geographical area. It should be insisted upon that each series of parasites is to be discussed on its merits. The genus *Docophorus* seems little given to variation other than in size and colour; but *Nirmus* and *Lipeurus* are full of surprises. It would be hard to say, *e.g.*, how many absolutely distinct species are at present confused under the name *N. furvus*, N. The ♀ ♀ offer such slight differences that one would never imagine they were of specific value apart from the confirmatory evidence supplied by the other sex. The ♂ ♂ too are very similar, but by the genitalia are sharply separated from one another. We are, of course, here at the margin of a wide question, viz. what characters are to be regarded as specific in the group *Mallophaga*. We only wish to state our opinion that while similar

Philopterid forms from a wide range of hosts may truly enough, as in the present case, represent one species, there is nothing unnatural or unlikely in their being referable to distinct species. Both conditions in fact do, we believe, occur. The even more improbable case of two extremely similar* species occurring on the same host species, is found in the genus *Nirmus* on so common a British bird as *Turdus merula*.

Docophorus excisus, N. (1818).

Docophorus excisus, Nitzsch, in Giebel, Ins. Epiz. p. 88, pl. ix. figs. 1, 2, 3 (1874).

♀. *Hirundo rustica.*

Docophorus lari, Denny (1842).

Docophorus lari, Denny, Monogr. Anopl. Brit. p. 89, pl. v. p. 9 (1842).

♂. *Tringa subarquata.*

5 ♂♂. *Diomedea melanophrys.*

2 ♂♂, 4 ♀♀, 4 imm. *Larus dominicanus.*

2 ♂♂, 3 ♀♀. *Larus hartlaubi.*

17 ♂♂, 16 ♀♀, 27 imm. *Larus hartlaubi.* Table Bay, July, 1913.

8 ♂♂, 5 ♀♀. *Larus hartlaubi.* Table Bay, Sept., 1913.

Piaget (Les Pédiculines, p. 112, 1880) reports a var. *parva* from *Larus dominicanus* (Valdivia), but we prefer to leave the discussion of varieties over till we have seen material from more species of South African *Larus*.

Docophorus leucogaster, Giebel (1874).

Docophorus leucogaster, Giebel, Ins. Epiz. p. 300 (1874).

13 ♂♂, 11 ♀♀, 6 imm. *Buteo jakal.* 1912–1913.

Not having seen examples of *D. platyrrynchus*, N., we are unable to say from examination of the genitalia how the insects compare. But there is every reason to believe on general grounds that *D. leucogaster*, G., is a synonym or at most a variety of Nitzsch's species.

Docophorus melanocephalus, N. (1818).

Docophorus melanocephalus, Nitzsch, in Giebel, Ins. Epiz. p. 110, pl. xi. fig. 8 (1874).

2 ♀♀. *Sterna bergii.* May, 1913.

* Analogous to the occurrence of, say, two *cursor*-like *Docophori* on the same species of owl.

Docophorus rostratus, N.

D. rostratus, Nitzsch, in Giebel, Ins. Epiz. p. 76, pl. x. fig. 4 (1874).

2 ♀ ♀. *Bubo capensis.*

See remarks under *cursor*. Apparently a scarcer species.

Gen. NIRMUS, Nitzsch.

Nirmus, Nitzsch, in Germar's Mag. f. Insekt. vol. 3, p. 291 (1818).

Nirmus actophilus, Kell. and Chap. (1899).

N. actophilus, Kellogg and Chapman, New Mallophaga, iii. p. 78, pl. vi. fig. 4 (1899).

See also *N. holophaeus*, Nitzsch, in Giebel, Ins. Epiz. p. 158, pl. v. fig. 1 (1874).

N. subcingulatus, Nitzsch, in Giebel, Ins. Epiz. p. 158 (1874).

♀. *Tringa subarquata.*

This is a *Nirmus* of the *holophaeus*, N., type (*Machetes*). But *holophaeus* is only one member of a very bewildering series of which *actophilus* is perhaps the smallest term. Possibly *N. subcingulatus*, N. (*Strepsilas interpres*), denotes the present insect, but we prefer in the meantime to use Kellogg and Chapman's name as their figure and description more recognizably apply to the above ♀ and similar material in our own collection.

Nirmus decipiens, N. (1818).

Nirmus decipiens, Nitzsch, in Giebel, Ins. Epiz. p. 162, pl. xv. fig. 4 (1874).

8 ♂ ♂, 9 ♀ ♀, 3 imm. *Recurvirostra avocetta* (Avocet). Dec., 1912. Philipstown, C.P.

Three species of *Nirmus* appear to be peculiar to the Avocet, and Dr. Péringuey has fortunately secured all (see in addition under *N. pileus*, N., and *N. signatus*, P.). Dr. Yngve Sjöstedt collected the two last-named from *R. avocetta*, Natron Lakes, Kilimandjaro-Meru, but did not take the present insect. (See Kellogg, Wissenschaft. Ergeb. der Schwedisch., Zoolog. Exped. Nachdem Kilimandjaro, etc. Deutsch. Ostafrickes, 1905–1906, 15 Corrodentia, 4 *Mallophaga*, p. 47. Uppsala (1908).)

Nirmus gracilis, N. (1818).

Nirmus gracilis, Nitzsch, in Giebel, Ins. Epiz. p. 143, pl. v. figs. 11, 12 (1874).

♂. *Hirundo rustica.*

NIRMUS MACROCEPHALUS, spec. nov. (Pl. XXV., figs. 2 and 5.)

10 ♂ ♂, 14 ♀ ♀. *Aegialitis pecuaria.*
7 ♂ ♂, 8 ♀ ♀. *Aegialitis tricollaris.* Sept., 1913.
13 ♂ ♂, 8 ♀ ♀. *Aegialitis marginata.* Sept., 1913.

This is a very characteristic *Nirmus* of the *bicuspis*, N., type. [Giebel, Ins. Epiz. p. 155, pl. v. figs. 11, 12 (1874).] We do not give a detailed description of the chaetotaxy, since such differences as we have noted between the South African insect and *N. hiaticulae*, D. [Monogr. Anopl. Brit. p. 136, pl. xi. f. 10 (1842)], (which we take to be *bicuspis*, N.), and *N. opacus*, Kell. and Chap. [New Mallophaga, iii. p. 83, pl. vi. fig. 6 (1899)], are probably immaterial. We have *hiaticulae* from Britain, and Professor Kellogg has very generously presented for dissection one of the three extant ♂ ♂ of *opacus*.

The chief distinguishing feature externally is the long head, which is also extremely narrow, viz. ♂ length ·4 mm., breadth ·27 mm. (*opacus* ·4 and ·31). In *macrocephalus* the signature is short and broad, in *opacus* more elongated with a backwardly produced apex. Length *macrocephalus* ♂, 1·35 mm.; *opacus* ♂, 1·11 mm.

The genitalia of *macrocephalus* are distinct. The basal plate is posteriorly (as it lies in the insect "anteriorly") expanded. The paramera are evenly curved almost their whole length, and bear the ventral hair far forward, apically the paramera contract rather suddenly. The meosome is long with parallel sides. The **V**-shaped ventral pattern extends to the articulation of the paramera with the basal plate. Each endomer is slightly contracted near the apex, where there are in side-view one or two rugose papillae which may bear minute sensory hairs. Ventrally 3 or 4 hairs on each endomer. The penis with the telomers distinctly fails to reach the level of the endomers. In *hiaticulae*, D., and *opacus*, Kell. and Chap., the basal plate is small and narrowed posteriorly. The paramera bend more abruptly than in *macrocephalus*, and at a greater distance from the apex. The ventral hair is thus placed not so far forward. The paramera are considerably narrowed on the apical third in both forms, but they are more slender near the basal plate in *opacus* than in *hiaticulae*. In both the penis, the endomers, and the telomers reach the same level. The penis is thicker than in the form described. The sides of the mesosome are in *opacus* curved from base to apex, in *hiaticulae* sub-parallel for the greater part of their length. The minute hairs are also more numerous in *opacus* than in *hiaticulae*. All three forms are close to one another,

however. Yet it is impossible, we think, till more of this type have been investigated to say what value is to be assigned to the differences between members of the *bicuspis* group. They are not, we imagine, varieties in the sense that *atrimarginatus*, K. and C., is a var. of *Nirmus lineolatus*. It may be advisable ultimately to arrange them in a trinomial series.

Dimensions of Macrocephalus ♀.

	Length.	Breadth.
Head	·430	·300
Prothorax	·116	·200
Metathorax	·183	·290
Abdomen	·971	·470

Total length of ♀ 1·68 mm.

The *bicuspis* type of *Nirmus* though occasionally found on other *Limicolae* is probably specially attached to the genus *Aegialitis*.

Nirmus melanophrys, N.

N. melanophrys, Nitzsch, in Giebel, Ins. Epiz. p. 146 (1874).

2 ♂♂, ♀. *Upupa africanus* (South African Hoopoe). Philipstown, C.P.

Imm. *Upupa africanus*. April, 1913.

Nirmus nebulosus, Denny (1842).

Nirmus nebulosus, Denny, Monogr. Anopl. Brit. p. 132, pl. xi. f. 13 (1842).

♂, 9 ♀♀. *Sturnus vulgaris*. Sept., 1913.

♂, 4 ♀♀, 4 imm. *Sturnus vulgaris*.

This host—the common starling of Europe—has been introduced into South Africa.

Nirmus pileus, N. (1818).

Nirmus pileus, Nitzsch, in Giebel, Ins. Epiz. p. 162 (1874).

For note see under *N. decipiens*, N.

2 ♂♂, 25 imm. *Recurvirostra avocetta* (Avocet). Dec., 1912. Philipstown, C.P.

Nirmus punctatus, N. (1818).

N. punctatus, Nitzsch, in Giebel, Ins. Epiz. p. 176, pl. iv. figs. 1, 2 (1874).

N. punctatus lingulatus, var. nov.

30 ♂♂, 27 ♀♀, 6 imm. *Larus hartlaubi*. Table Bay, July, 1913.

An interesting series representing one of the good colour varieties to which the larine *Nirmi* give rise. An excellent example of such variation is *N. lineolatus*, *N.* var. *atrimarginatus*, Kellogg and Chapman, New Mallophaga, pt. iii. p. 75 (1899). The present variety of *punctatus* is more ornately marked than the type. Its position can best be understood by considering it along with the typical form and *N. felix*, Giebel (Ins. Epiz. p. 175, 1894), between which it is evidently intermediate. In doing this, while we are completely satisfied that the South African insects merit only varietal rank, we have no desire to express an opinion on the status of *N. felix*, which Kellogg considers a valid species. We wish only to state the evidence in so far as it is available.

With regard to the markings :—

(*a*) *N. punctatus* of typical ♂ form shows on the head a moderate spot at the eye, a second, often faint and not infrequently wanting, a short distance in front of the antennae, and a third not far from the clypeal edge. These six with the pair on the occiput (which really shine through from the inserted portion of the prothorax) make up the 8 spots of which Piaget (Les Pédiculines, p. 200) speaks. Two pairs of spots on prothorax at anterior and posterior angles respectively. The metathoracic margin is really clear, but there are below 4 spots which shine through. In the abdomen the lateral bands are clear. At their broadest region (at the suture) each is crossed by an elongated spot which does not project inwards beyond the band.

There is on segments 2–7 a median elongated spot.

(*b*) *N. punctatus lingulatus*. ♂. The spots of the head are all invariably present, being very dark and slightly larger than in the preceding. The temples are still uncoloured. The transverse abdominal spots have become *narrow* bands projecting inwardly far beyond the chitinized lateral band, especially on segments 3–5. The inner end of these transverse black bands is upturned towards the head of the insect. The median elongated spots are more extensive.

(*c*) *N. felix*, G. ♂. From Kellogg's figures one sees that the spots of the head are still larger and denser : that in the clypeus the anterior portion of the antennal band is now also darkened ; that the temporal margin is also coloured uniformly and in the same way the metathoracic sides. The transverse abdominal bands are broader, and the lateral bands are partly coloured besides ; while on segments 7–8 the whole lateral band is darkened.

The under surface (♂) of the three forms may be compared in a sentence. In *punctatus* there are on each of sternites 4–6 a pair of

narrow elongated black spots. These are often defective. In *lingulatus* all 6 are present—the median pair (st. 5) being broader and showing as well in some specimens on inwardly projecting anterior angle. In *felix* all 6 are moderately broad—the median pair being wider than the others and connected at the inner anterior angles by a dark linear band. As regards markings, then, *punctatus*, *lingulatus*, and *felix* form undoubtedly a graduated series.

It is desirable that, when possible, specific definitions should be based on morphological characters. In the *Mallophaga* we believe the best characters are to be found in (*a*) the head, and (*c*) the ♂ genitalia, and occasionally, too, those of the ♀. The characters to be relied on in these regions are the shape and chaetotaxy.

We have critically examined typical *punctatus* and var. *lingulatus*, and find their agreement very complete. Professor Kellogg beautifully illustrates *N. felix*, G. (New Mallophaga, pt. i. pl. vi. figs. 3, 4, 1896), and though no details of the genitalia are alluded to in the corresponding text (p. 110), we think that two remarks may be safely ventured.

I. That *felix* is more closely related to *punctatus* than to any other of the gull *Nirmi*. This is seen in the shape of the head and in the figure of the genitalia which, though drawn on a small scale, are easily seen to be of the *punctatus* type. The genitalia of *punctatus* are unique so far as we know in the group to which the species belongs. The paramera are broad and abruptly bent at a little beyond half-way from the base. The extreme top of each paramer is darkened and the rest of the apparatus consists of a delicate hyaline chitin. Thus the species may be said to maintain its "*punctatus*" character throughout. In *lineolatus* the paramera are evenly bent, dark and of moderate breadth. This is a common type (see Kellogg, *loc. cit.* pl. vi. figs. 7–8). The paramera of *felix* are of the peculiar "*punctatus*" type, being, according to Kellogg's figure, broad and sharply bent. They differ, however, in being completely darkened, which would incline one to expect some concomitant structural difference indicating a valid species. These facts, together with what has been said about the markings, reinforce the view of the affinities of *felix* suggested above.

II. Piaget (1880) (Les Pédiculines, p. 201) held that *felix* is a variety of *punctatus*. Kellogg holds the contrary view. The following, then, would seem to be the alternatives.

(*a*) That *felix* is a richly marked variety of *punctatus* in which the dark coloration at first in spots has assumed the form of bands, invading also finally the lateral bands and the usually colourless genitalia.

(*b*) That it is a species closely approached by a variety, *lingulatus*, of its nearest congener.

Nirmus signatus, Piaget (1880).

Nirmus signatus, Piaget, Les Pédiculines, p. 186, pl. xv. fig. 8 (1880).

See also under *N. decipiens*, N.

♂, ♀. *Recurvirostra avocetta* (Avocet). Dec., 1912. Philipstown, C.P.

Nirmus varius, N.

N. varius, Nitzsch, in Giebel, Ins. Epiz. p. 130, pl. vii. figs. 2, 3 (1874).

[Kellogg and Paine have already (Bull. Ent. Res. ii. p. 147, pl. v. figs. 5, 5*a*, July, 1911) recorded this species from Oshogbo, S. Nigeria (*Corvultur albicollis*) and from Malachal, Egyptian Sudan, on starling.]

13 ♂ ♂, 6 ♀ ♀, 5 imm. Host unknown,
18 ♂ ♂, 16 ♀ ♀, 50 imm. *Corvus capensis.*

We have not sufficient material from European hosts for comparison with the above, and cannot say how far they are typical. The *Docophorus* of *Corvus capensis* (not reported on in this instalment) taken with the above *Nirmus* does not seem referable strictly to any of the usual corvine types. Much more, therefore, one might expect the accompanying *Nirmus* to vary. So far as descriptions carry one this does not seem to be the case. It must be remembered that the corvine *Docophori* are a very plastic group—at least as regards markings.

Nirmus vittatus, G. (1874).

N. vittatus, Giebel, Ins. Epiz. p. 127 (1874).

By using this name we mean the raptorial *Nirmus* in which the first abdominal band is medianly excised opposite a point-like mark on the posterior margin of the metathorax. Most of the following examples are referable to this well-defined type.

35 ♂ ♂, 20 ♀ ♀, 5 imm. No date.
From *Buteo jakal* 14 ♂ ♂, 16 ♀ ♀, 40 imm. 1912.
82 ♂ ♂, 83 ♀ ♀, 55 imm. 9 : iv : 13.
18 ♂ ♂, 12 ♀ ♀, 6 imm. March, 1913.
9 ♂ ♂, 9 ♀ ♀, 4 imm. Philipstown, C.P.
14 ♂ ♂, 15 ♀ ♀, 9 imm. *Eutomactus spilogaster.*
4 ♀ ♀, 10 imm. *Eutomaetus pennatus* (Booted Eagle).
The last lot are much shrivelled.

3 ♂ ♂, 5 ♀ ♀, 5 imm. *Melierax canorus* (Chanting Goshawk). Philipstown, C.P.

7 ♂ ♂, 10 ♀ ♀, 3 imm. *Circus macrurus* (Pale Harrier). Philipstown, C.P.

Nirmus vulgatus, Kellogg (1896).

Nirmus vulgatus, Kellogg, New Mallophaga, ii. pp. 496–498, pl. lxvii. f. 5 (1896).

♂, 2 ♀ ♀, 2 imm. *Passer arcuatus.* Cape Town, x : 12.

2 ♂ ♂, 2 ♀ ♀, 2 imm. *Passer arcuatus.* March, 1913.

♂. *Amadina erythrocephala* (Red-headed Weaver Bird). Philipstown, C.P.

Kellogg and Paine (Bull. Ent. Res. vol. ii. p. 148, July, 1911) record "numerous specimens from the starling and one from an owl, Malachal, Egyptian Sudan (H. H. King). This is the first record of this American species, which is found widely distributed on American passerine birds, from a host in the Old World."

But the species also occurs on Palaearctic passerines; when therefore the synonymy of the group is better understood it will not be surprising to find *vulgatus* give way to an older name.

Nirmus zonarius, N.

♂. *Nirmus zonarius*, Nitzsch, in Giebel, Ins. Epiz. p. 166 (1874).

♂, 2 ♀ ♀. *Tringa subarquata.*

We use the name *zonarius* for the *Nirmus* of the general type *cingulatus*, got on a variety of small waders. *Zonarius*, though a good species, is extraordinarily like its larger congener; but the genitalia are different.

Family GONIODIDAE.

Gen. GONIOCOTES, Burmeister.

Goniocotes, Burmeister, Handb. Ent. vol. 2, p. 431 (1835).

Goniocotes bifasciatus, Piaget (1885).

Goniocotes bifasciatus, Piaget, Les Pédiculines, Suppl. p. 47, pl. v. f. 6 (1885).

Four lots from *Spheniscus demersus*—

(*a*) ♀, (*d*) Table Bay, 1913.

(*b*) 58 ♂ ♂, 81 ♀ ♀.

(*c*) 62 ♂ ♂, 56 ♀ ♀, 15 imm.

(*e*) 34 ♂ ♂, 40 ♀ ♀, 10 imm.

This peculiar species, as the above records show, is abundant on its special host. A new genus will ultimately be required for its reception.

Eric Mjöberg, "Studien über Mallophagen and Anopluren" (Archiv for Zoologi. Band. 6, N : O. 13, p. 108, Upsala and Stockholm, 1910), remarks, "Von dieser sehr charakteristichen Art, die nur einmal und zwar Von Piaget, in der Literatur Erwähnung gefunden hat, liegen mir einige Exemplare von demselben Vogel, *Sphaeniscus magellanicus*, vor, (Afrika, Kaudern)."

[*Sphaeniscus magellanicus*, specifically different from *S. demersus* is not found on the African coast. Either Mjöberg's specimen was badly identified, or the locality "Afrika" is wrongly given.—Editor.]

Gen. GONIODES, Nitzsch.

Goniodes, Nitzsch, in Germar's Mag. f. Insekt. vol. 3, p. 293 (1818).

Goniodes falcicornis, N. (1818).

Goniodes, falcicornis, Nitzsch, in Giebel, Ins. Epiz. p. 198, pl. xii. figs. 14, 15 (1874).

9 ♂ ♂, 13 ♀ ♀, 23 imm. *Pavo cristatus* (Peacock).

In some of the above reckoned as adult the markings are not fully established but the sex is plainly indicated.

Goniodes minor, Piaget (1880).

Goniodes minor, Piaget, Les Pédiculines, p. 256, pl. xxi. fig. 3 (1880).

♀. *Turtur capicola.*

♂. *Vinago delalandi*, Port St. Johns, C.C., Nov., 1901. Shortridge.

GIEBELIIDAE, fam. nov.

We erect this division for these forms, hitherto included amongst the Philopteridae, which are furnished with a broad transverse flap on the under side of the clypeus. This flap projects to form characteristic horns or knobs at the sides of the clypeus.

Only three genera are certainly to be placed here at present—*Giebelia*, Kellogg, *Mackayia*, Waterst., and *Philoceanus*, Kellogg; *Giebelia* and *Mackayia* apparently represent a line of direct development, of which three stages are to be seen in *G. mirabilis*, *M. dimorpha*, and *M. heteracanthus*; *Philoceanus* is a more isolated form which we have not seen.

It may be possible later to diagnose this family more fully. Probably the definition should include the peculiar banding and chaetotaxy of the head, etc. Meanwhile the membranous folded

flap is sufficiently characteristic of this small but remarkable group of parasites.

Gen. GIEBELIA, Kellogg.

Giebelia, Kellogg, New Malloph. pt. 1, p. 137 (1896).

Giebelia hexakon, spec. nov.

(Pl. XXV., figs. 7 and 11; Pl. XXVI., fig. 14.)

♂, 4 ♀ ♀. *Majaqueus aequinoctialis* (Cape Hen).
One of these ♀ ♀ is merely a skin.

The occurrence of a species of *Giebelia* in the Atlantic is interesting. Hitherto known as a *Puffinus* parasite from the Pacific only, this genus proves to have a wider range both in hosts and in distribution.

A larger paler form than *G. mirabilis*, Kell., with which at first we were inclined to identify Dr. Péringuey's material. On comparison with a pair of paratypes forwarded by Professor Kellogg some interesting differences, undoubtedly of specific value, appear. These are to be found (*a*) in the head, (*b*) genitalia ♂, and (*c*) in the shape of the marginal bands of the abdomen. In general chaetotaxy these Giebeliid forms are practically identical (see under *Mackayia heteracanthus*). We therefore draw attention merely to the following features.

♂. The head is proportionately broader behind in *hexakon* than in *mirabilis*. The antennae are quite simple. In fact the general facies of the head is reminiscent of ♀ *mirabilis* rather than the ♂. The projecting knobs of the membranous fold are large. A unique feature, reminiscent also of the ♀ ♀ of this group, is the presence in the ♂ of a short backwardly curved branch of the antennal band which bears terminally just above the base of the antennal joint a heavy spine. The 4 similar spines of *mirabilis* are also present, and from these 6 pike-like outgrowths the species is named.

On the inferior aspect of the head the eye is produced into a short blunt hooked process directed forwards. The eye itself, as in *mirabilis*, is extremely prominent. The greatest width of the head lies between the eyes. In the allies of *hexakon* the greatest width is just below the eyes. There is almost no difference in shape or dimensions between the heads of the sexes in this species (see tables), but the ♀ temples swell out slightly beyond the eye. The genitalia ♂ are quite distinct from those of *mirabilis*. The basal plate is longer and narrower. The paramera are bent only at their articulation with the plate. Thereafter they run with parallel sides to near the apex. The penis is longer than in *mirabilis*.

♀. The head is longer and broader than in *mirabilis*. The internal incrassations of the lateral bands of the abdomen are also more pronounced.

Dimensions of Giebelia hexakon.

	♂		♀	
	Length.	Breadth.	Length.	Breadth.
Head	·570	·570	·585	·585
Prothorax	·185	·400	·185	·406
Metathorax	·185	·514	·171	·471
Abdomen	·785	—	1·040	—
Segment 4	—	·7	—	·75
Total ...	1·77	—	1·97	—
Antennae 1	·076	·05	·076	·050
Antennae 2	·060	·036	·056	·030
Antennae 3	·036	·033	·030	·030
Antennae 4	·026	·026	·026	·026
Antennae 5	·040	·026	·040	·023
Length of Antennae	·23	—	·22	—

Gen. MACKAYIA, Waterston.

Mackayia, Waterston, Ann. Scott. Nat. Hist. p. 251 (1913).

Mackayia heteracanthus, Waterst. (1912).

(Pl. XXV., fig. 8; Pl. XXVI., figs. 13, 16, 18.)

Mackayia heteracanthus, Waterston, The Scottish Naturalist, p. 258 (1912).

♂, ♀. Types *Procellaria* (*Ossifraga*) *gigantea* (Giant Petrel).

2 ♂ ♂. *Oceanites oceanicus* (Wilson's Storm Petrel). 26 : iii : 04. P. Bonomi, coll.

Description of M. heteracanthus.

In general facies and chaetotaxy very similar to *M. dimorpha*, Waterst. (The Scottish Naturalist, pp. 251–7, figs. 1–6, 1913), from which, however, it may be separated by the head and ♂ genitalia.

♂. *Head.* Clypeus straight with rounded angles. Bands curved towards one another, anteriorly each bears three short hairs—one above, one at the edge, and a third below and somewhat behind the first two. There rises also from below, but farther back, a longer hair which projects beyond the edge. On the upper surface of the clypeus there is a longish hair between the band and the edge of the signature, at about the level of the peculiar labral folding. Signature reaching back to the mandibles, where it fuses broadly with a transverse internal band connecting the antennals. The pre-sutural portion of the signature bears apparently two hairs, but careful

focusing shows that these rise on the under side of the head. On either side of the apex of the signature is a short strong bristle directed backwards.

The antennal bands (cf. *M. dimorpha*), connected by a medianly swollen transverse internal band, advance anteriorly to the somewhat indefinite suture, while posteriorly they curve very distinctly inwards, each bearing terminally a heavy peg-like spine. At the outer edge above the first antennal joint there is a minute bristle. In front of the peg-like spines referred to and before the band connecting the antennals are two short bristles.

The ocular band, especially on the inferior surface of the head, is more strongly developed than in *M. dimorpha*. Besides the dark spot before the eye there is a distinct branch running towards the posterior region of the antennal band (this is more apparent below). The occipital bands have a strong dark basal spot. They are set widely apart and diverge considerably in their outwardly curved course till they practically join with the ocular bands. There is, as in *M. dimorpha*, a tendency to branching on the inner aspect of the bands.

Antennae deeply inset in the head; 1st joint as long as the succeeding 4 together, with a large appendage near the base. The upper posterior median region with a deep excavation from which rise 2 hairs. First joint a triangle with truncated apex, broad at the base and appreciably narrowed where it gives rise to the 3rd joint, which bears a broad sinuous appendage, furnished near the apex with a relatively strong hair. Fourth joint very short; 5th joint nearly twice as long as the 4th. Trabeculae long, reaching to about the middle of the 1st joint. Eye prominent, large, with 1 bristle. Across the middle of the post-ocular region of the head runs a row of 4 bristles, lying 1, 2, 1, in the three regions separated by the occipital bands. In front of each of the median pair is an extremely minute hair, while behind near the occiput are 2 longer hairs.

Between the eye and the base of the occipital band are the following: 2 very short bristles, 2 long strong hairs, 1 long weaker hair, 1 short bristle. The occiput itself is bare.

The margin of the head from the eye to a little beyond the base of the occipital band is incrassated, while the middle of the occiput is bare.

On the ventral surface of the head, at about the level of the clypeal suture, is an entire transverse membranous flap folded on itself at the sides to form there knotted triangular processes distinctly seen from above. Between these projections the clypeus

is apparently hinged along a narrow transverse crease. This interpretation is supported by the presence on the inner anterior aspect of the antennal bands of a curious knot-like projection which fits into a socket-like modification of the signature. The signature is thus characteristically hollowed on both sides (cf. *Giebelia* and *M. dimorpha*).

Thorax. Prothorax much broader than long, sides rounded and heavily thickened, 2 minute bristles anteriorly on the dorsum.

Metathorax bears, like the prothorax, 2 minute bristles anteriorly on dorsum; sides divergent, much thickened; posterior margin rounded over abdomen. At the posterior angle and for some distance along the edge a row of pustulated hairs—6 in all on each side. The pustules are regularly disposed, but from its position the hair at the corner diverges more than the others, which thus come to form a row by themselves. Median region of hind margin clear. On the sternum the chitinous ribs between the coxae are strongly developed. Prosternum bare, metasternum 4 hairs, 2 between mid-coxae, 2 between hind coxae.

Abdomen. The dorsal bands are continuous on all the segments, being broad on 1, 2, 3–8, and narrowed medianly on the others. The minute terminal segment is uniformly brown. In shape the abdomen is elongated oval. The margin is distinctly toothed from the overlapping of the segments.

The lateral bands, except on the first segment, are strongly developed; on the under surface they are clearly defined, but above they are less plainly limited owing to fusion with the transverse markings of the tergites. Each band shows an almost rectangular median appendage. There is also a thickening of the band along the inner anterior edge to form a second minor appendage which more or less enters the previous segment. The number of hairs on the lateral bands ranges up to 4 (below) and 2 (above), reckoning, as on the band, all hairs outside the stigma. The maximum of 6 is found on segment 7; 1–2 of these hairs project at the angle.

The first abdominal segment differs from the others (2–7) in being slightly narrower ($\frac{1}{7}$ less), in the presence of 2 minute hairs anteriorly in the middle of the tergite (cf. thorax) and of 1 hair on each side at about $\frac{1}{3}$ from the posterior angle, and also in the reduced thickening of the sides which show no median appendage. Two median hairs on hind border.

Tergites 2–8 are sub-equal in length, with large stigmata on 2–7.

The 2nd tergite bears 2 median hairs on hind border. The 3rd–5th bear 3–4 median hairs and 1 on each side before the

stigma. The 6th–7th bear 2 median hairs, 1 before the stigma and 1 immediately below, *i.e.* 6 in all.

The 8th tergite bears 6 hairs (3, 3) above the emergence of the genitalia. The 9th tergite bears at the sides 2 patches of minute bristles.

On the under surface the segmental bands are sharply limited and do not join the laterals. The 1st sternite bears 4 hairs, 2nd st.–5th st. bear 6 hairs, 6th st. bears 4, 7th st. bears 2, and there are a few terminal hairs on the indistinct genital mark. The genitalia are large and peculiar. The paramera are broadly curved near their origin and again at the apex, so that the exserted apparatus is lyre-shaped. The first upper pair of appendages are here broad, leaf-like structures with underneath 2 strong chitinous rods. The homology of these rods is uncertain, and there is unfortunately not enough material to permit of dissection. The genital mark is very similar to that of *M. dimorpha*.

♀ The main differences between the sexes are to be found in the head. *M. heteracanthus*, like *M. dimorpha*, is distinctly dimorphic. The occipital bands are sharply defined. They are curved *towards* one another, and not outwardly, as they run forward. Anteriorly each fuses with the ocular and antennal bands. The transverse band connecting the antennae in the ♂ is medianly incomplete in the ♀. Thus the apex of the signature is clearly seen. Antennae simple, trabeculae as long as the swollen 1st joint. For details see table.

In neither sex do the *legs* call for remark. They are moderately stout and Docophoroid in structure, but the large coxae of the ♂ show rather a Lipeuroid feature.

Measurements of Mackayia heteracanthus in mm.

	♂		♀	
	Length.	Breadth.	Length.	Breadth.
Head	·500	·457	·542	·442
Prothorax	·135	·335	·128	·342
Metathorax	·185	·464	·185	·485
Abdomen	·907	—	·928	—
Segment 1.....	—	·40	—	·457
Segment 4.....	—	·57	—	·685
Total ...	1·727	—	1·783	—
Antennae 1	·14	·063	·063	·05
Antennae 2	·07	·036	·05	·03
Antennae 3	·03	·073	·026	·026
Antennae 4	·02	·028	·026	·023
Antennae 5	·036	·026	·035	·021
Length of Antennae	·3	—	·2	—

Notes on *Giebelia* and *Mackayia*.

Having all the known forms of these peculiar parasites before us, we have drawn up the following tables for their differentiation.

Key to Genera.

The sexes with similar simple antennae which are carried gently recurved. Anterior edge of trabecula, measured from the apex to the hair at the junction with the edge of the head, distinctly longer than the 1st antennal joint .. *Giebelia.*

The sexes with dissimilar antennae which are carried in the ♂ bent sharply back. One or more joints with an appendage. Basal joint (♂) with a distinct fovea on upper surface, edge of trabecula markedly less than length of 1st antennal joint ($\frac{2}{3}$ to $\frac{1}{2}$) .. .. *Mackayia.*

Key to Species of Giebeliidae.

(For the more convenient handling of the ♀ ♀ we treat all the species together).

♂ ♂.

A. Antennae simple.

a. Six peg-like spines on head, 1 on each side of signature, 1 on an extension of the antennal band above the 1st antennal joint and 1 at the end of another band which curves inwards from the base of the antennae. (We may refer to these 3 parts as "anterior," "lateral," and "posterior" respectively.) Paramera straight with parallel sides. Basal plate narrow .. .. *Gibelia hexakon*, n. sp.

b. Four peg-like spines, 2 anterior, 2 posterior, the lateral pair represented by minute spines. Paramera distinctly curved. Sides not parallel, there being a sudden concavity on the inner edge near the base. Basal plate short and broad .. .. *Giebelia mirabilis.*

AA_1. Antennae with appendages.

a'. Antennae with 1 appendage on 3rd joint. Anterior edge of trabecula $\frac{2}{3}$. 1st antennal joint. Spines as in *G. mirabilis* ♂, eye prominent and round. Paramera short, broad, and once curved .. .. *Mackayia dimorpha.*

b'. Antennae with appendages on 1st and 3rd joints. Anterior edge of trabecula $\frac{1}{2}$ 1st antennal joint, anterior spines bristle-like, eye not prominent, paramera twice bent .. .. *Mackayia heteracanthus.*

♀ ♀. In describing *M. dimorpha* and *M. heteracanthus* ♀ ♀ we have mentioned that the transverse band between the antennals, which is so conspicuous a feature of the ♂ ♂ forehead, is interrupted near the signature. In both ♀ ♀ of the *Giebelia* spp. this band is conspicuous though uncoloured and very narrow on either side of the apex of the signature. By this feature we find it very easy to separate the ♀ ♀ actually before us. We do not care to use this character, however, in the following table, as on recurring to our ♀ ♀ *Mackayia* we find that there are membranous creases

connecting the closely approximated points of the long transverse bands stretching inwards from the antennals.

A. Anterior pair of spines thin .. .. *Mackayia heteracanthus.*

A.A. Anterior spines peg-like .. .. *B.*

B. Lateral bands with distinct median projecting incrassation on segments 6 and 7 only; on 4 and 5 the bands are merely swollen on the inner median aspect *Giebelia mirabilis.*

B.B. Lateral bands on segments 2–7 with projections on the inner middle aspect .. .. *C.*

C. Larger species (1·97) all over especially in the breadth of the prothorax and abdomen. The central marginal pair of bristles on tergites 6–8 forming two divergent lines . . each bristle or hair being nearer to the marginal bristle before and below the stigma than to its neighbour .. .. .. *Giebelia hexakon.*

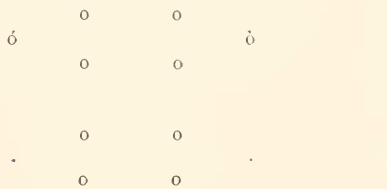
Smaller species (1·81). The central marginal pair of bristles on tergites 6–8 in parallel rows . . each bristle nearer its neighbour than to the stigmatic bristle *Mackayia dimorpha.*

There are other very slight and possibly inconstant differences between *dimorpha* and *hexakon* ♀ ♀, *e.g.* in the 1st antennal joint (longer in *hexakon*). Again the entrant heads of the abdominal lateral bands are more angled on their outer aspect in *dimorpha.* In *hexakon* they are almost round.

The most remarkable differences are probably in the dimensions of the head.

These ♀ ♀ are, however, somewhat difficult to separate. It does not seem advisable to enumerate minute comparative differences as their significance can be estimated only when more species are known. We venture to think that many species of *Giebelia* and *Mackayia* will yet be found on Tubinarial hosts.

Special reference has been made in the above tables to six spines or pegs on the head. As these are probably important throughout the group, their arrangement in the four species now dealt with may be graphically put thus:—



	o	o		*Gicbelia mirabilis* ♀.
ó			ò	*Giebelia hexakon* ♀.
	.	.		*Mackayia dimorpha* ♀.
	.	.		
.			.	*Mackayia heteracanthus* ♂.
	o	o		
	.	.		
ó			ò	*Mackayia heteracanthus* ♀.
	.	.		

In the above o = peg-like spine, ò = do. on special branch of antennal band, and . = short spine.

The marginal bands have been used in discriminating between the ♀ ♀. If the specimen of this sex of *G. mirabilis* supplied by Kellogg is thoroughly typical it may be set aside at once by the simplicity of the bands on segments 2 and 3. The ♀ ♀ of the 4 spp. do not quite agree in these bands, and some of these are figured for comparison.

The ♂ eye of the 4 species shows minute modifications which we think of some importance. In *hexakon* (which is probably the most primitive of all) and *mirabilis* the eye is exceedingly prominent, and at it the temple bends rectangularly. In *dimorpha* the eye is still prominent and large, but the angle is blunter. In *heteracanthus* the whole temple from the base of the occipital band to the insertion of the first antennal joint is evenly rounded, and the eye has become elongate and comparatively inconspicuous. In *hexakon*, as noted in the description, there is a curious short process from the under side of the eye. We imagine this feature is less pronounced in *mirabilis*. We cannot certainly say it is present in *dimorpha*, and it seems to be wholly absent in *heteracanthus*.

The gradual disappearance of this projection and the diminution in the prominence of the eye are, we believe, to be correlated as compensatory for the rise of the heterocerous condition. The ♂ antennae are, we believe, accessory organs of copulation. In the more primitive forms the female is held somehow between the warped back antennae and the angle of the eye. Later the grasp is made securer by the development of an appendage to the 3rd joint. Finally a completely fast lock is established by (1) the processes from joints 1 and 3, and (2) joints 1 and 2. There is only one weak spot in this lock, viz. where the appendages touch one another, but if the whole antennae is pressed back, as it doubtless is, against the head, there can be no possibility of escape.

The significant point in the development of these insects is apparently when an appendage is produced on the 3rd antennal

joint. The rise of another appendage on the 1st joint has not the same value, as the latter modification is dependent on the presence of a modified 3rd joint. It is the whole 3rd joint which is altered, and only a small portion of the 1st which is produced. The 2nd appendage therefore seems to be only an elaboration of the original departure, and forms whether with one or with two appendages should be grouped together.

It is extremely interesting, though it is no more than the peculiar life conditions of the *Mallophaga* would lead one to expect, to find apparently primitive and much more advanced forms existing side by side. The ♀ ♀ are all primitive in facies. No good generic character separates them so far as we know. The same condition is found in the ♀ ♀ of *Lipeurus* spp. and *Nirmus* spp., of *Goniocotes* spp. and *Goniodes* spp. It is further to be noted that not quite mature ♀ ♀ of this group may be confused with *Docophorus*, as the clypeal modification is evidently late in development. The single specimen attributed to *Docophorus* mentioned by us in The Scottish Naturalist, Nov., 1912, p. 251, now seems to us to be only an immature ♀ of *Mackayia dimorpha*. By a clerical slip the example was referred to as a ♂.

There are evidently two lines of development in this order. I. Looking at such groups as the *Docophori latitemporalis*, the *Goniodes* of pigeons, the *Lipeuri* of herons, bitterns, and storks, or the *Nirmi* "*nigropicti*," one concludes that such groups have arisen by the modification of one ancestral type in each case. The archetype has split up into many new species, disappearing itself in the process. II. But in other cases development appears to have been intensive not extensive. *Lipeurus mutabilis* is in almost every detail, except colour and size, identical with *L. grandis*, but the latter bears highly modified antennæ with a large appendage on the 1st joint. *Giebelia* stands in a similar relation to *Mackayia*.

Family EURYMETOPIDAE.

Gen. EURYMETOPUS, Taschenberg.

Eurymetopus, Taschenberg, Die Malloph. p. 183 (1882).

In his Studien über Mallophagen, etc. (1910), Mjöberg very properly, it seems to us, erects this Family for the reception of *Eurymetopus taurus* and its allies. Ultimately, we believe, many species

will be included in this group, which is imperfectly understood. In general build *Eurymetopus* recalls now *Docophorus*, now *Lipeurus*, and again *Giebelia*. But the anchor-shaped genital apparatus of the male is unique, so far as we know, in the order. The specific characters of the group are apparently to be found (*a*) in the dimensions, (*b*) in the chaetotaxy of special regions, (*c*) in the 9th segment ♂, (*d*) in the genital apparatus of the ♂. This apparatus consists essentially of two main pieces: (1) the usual basal plate, (2) a solid portion which is near the junction with the basal plate broad, thereafter contracting into a neck and expending terminally into an anchor or arrow-shaped head. Through the middle of this free solid piece from base to tip or near it runs the seminal channel. Under a moderate power the surface of this arrow-like head and part of the expanded base appear to be striated or set with minute papillæ. Under an oil immersion these streaks resolve themselves into minute sensory channels circular in bore and slightly wider near the surface where each is connected with a minute bristle. The function of these sensory hairs is probably directive.

The whole apparatus is heavily chitinized. On the ventral surface there is placed basally a re-curved almost solid chitinous appendage. The homology of this apparatus is perplexing. Mjöberg (p. 248) regards the inferior appendage as the true penis, and takes the solid part lying in the genital chamber to be the fused paramera. He rejects Snodgrass's view (New Mallophaga, iii. p. 188, pl. xiv. fig. 5, pl. xv. fig. 1, 1899) that the terminal portion of the apparatus is the true "penis." As regards the first contention, the inferior appendage may be homologically the penis though we know no evidence for this, but it is practically solid and exhibits no aperture that we can discover. The *functional* penis, as Snodgrass has already shown, is the free portion of the apparatus with its anchor-shaped head, whose lumen is directly continuous with the ductus ejaculatorius. We do not think that any portion of this entrant body should be homologized with the normal Philopterid paramera. It is equivalent, apparently, with what we have called the mesosome. True paramera are apparently absent, though traces of them remain in a notch on each side of the mesosome near the base. These notches we interpret as indications of the former articulation of the paramera there, and they have persisted when the paramera themselves become obsolete, because they facilitated the upturning of the apparatus in the preliminary stages of copulation. The function of the paramera seems to be to find and elevate the lip-like ♀ valvule. This work is now probably performed by the greatly strengthened meso-

some. In some cases, we believe, the normal flat paramera after levering up the valvule establish a hold below that sclerite. The arrow-shaped head very likely acts similarly as an anchor also for a time, as just below each flange or fluke there is a directive bristle on a sensory area, much stronger than those already referred to.

In this ♂ apparatus the most useful characters are the shape of the basal plate and the relative proportions as well as the shape of base, neck, and head of the free portion.

We have seen at least three distinct species of *Eurymetopus*. The great bulk of Dr. Péringuey's material seemed referable to the form figured and described by Piaget as *taurus* (Les Pédiculines, p. 332, pl. xxxi. fig. 3, 1880). In New Mallophaga, i. p. 135, pl. xi. figs. 3–6 (1896) Kellogg recorded and excellently figured a species of *Eurymetopus* slightly smaller than true *taurus* with which, however, he at the time identified his captures from various Californian *Tubinares*. Through the kindness of Mr. Wm. Evans, Edinburgh, we have recently had an opportunity of examining an apparent ♂ of the Californian species, taken in the Pacific by the *Challenger* Expedition in the 70's of last century. And still more recently Professor Kellogg writes he is now of our opinion, having had both species from the Pacific and the Antarctic. The form he has already figured will thus soon receive a name from one best entitled to bestow it.

In Dr. Péringuey's gatherings there is a still smaller and more primitive species of the genus for which the name *Eurymetopus simplex* is here proposed. In almost every respect it appears to be a phylogenetic understudy of Kellogg's unnamed species. The antennae ♂ are simple in so far as they show no expansion terminally on the 3rd joint. But they have the extremely long 2nd joint so characteristic of the genus. The antennae, moreover, differ sexually. The presence of an appendage on the 3rd joint in *Eurymetopus* is, we may remark, more apparent than real. The joint as a whole is not much modified, but is merely a little wider terminally. But the distal edge being slanted, not transverse, and the 4th joint minute and placed back from the end of the 3rd joint somewhat, produce the impression of a considerable modification. The difference between the antennae of *simplex* and those of *taurus* is only comparative. These curious ♂ antennae, Lipeuroid in facies, are carried curved forward, and how they are applied is not plain.

We believe that in addition to the 3 species now noticed Mjöberg's diagram (Fig. 141) represents a valid 4th.

Notes on *Eurymetopus* spp. ♂.

i. *Eurymetopus simplex*, n. sp. Small size, 2·8 mm.

Head with distinct anterior clypeal angles; antennae simple in so far that the small 4th joint makes no appreciable angle with the 3rd; about 14 hairs in two rows on the temples; prothorax with 2 hairs at postero-lateral angles; postero-lateral angles of metathorax decidedly hooked with 7 hairs and 1 spine in transverse row. Abdomen, first 5 segments with 5–7 hairs in middle and 2 on each side at angles; 9th tergite with straight sides; 9th sternite far underlapping, with rounded angles and slightly concave, almost straight posterior edge; genital apparatus at rest not exposed. Basal plate with concave sides near junction with terminal piece; inferior appendage small. Base of mesosome moderate, notched near middle; neck short and broad; head arrow-shaped and longer than neck; seminal channel broad opening terminally.

ii. *Eurymetopus*, sp. ———, Kellogg. Medium size, 3·12 mm.

Head, metathorax and 9th segment much as in *simplex*. Genitalia with tip exposed (?) similar to those of *simplex*, but the base of the mesosome is broader and rounder; the neck is more slender and longer than the head, or as long. Antennae, 4th joint rising not quite terminally from the 3rd. About 24 hairs on the temple. Four hairs at prothoracic angles. Abdomen, first 4 segments with 8 median hairs, and at the angles of all the abdominal segments a row of 4.

iii. *Eurymetopus taurus*, N. Large species, 4·28 mm.

Head with short clypeus and reduced angles owing to the great development of the antennae, of which the 4th joint rises at a sharp angle from the 3rd. Temples and prothorax as in the preceding species. The metathoracic angles are only very slightly hooked and bear transversely 9 hairs and a spine. The sides of the abdomen bear at each angle 4 hairs as in the preceding. First and 2nd tergite with row of 9–10 hairs. The rest with 3–2 hairs. This form also agrees with Kellogg's in having 8 hairs on each half of the 9th tergite. This tergite, however, is scarcely triangular. It is rather continuously rounded and medianly slightly concave. The 9th sternite underlaps very little, medianly it shows a notch differing thus from both the others described.

Genitalia. Basal plate with straight edges and no appendages for attachment of muscles. Inferior appendage to mesosome, very large, base broad, neck slender, head much rounder than in the preceding species. Genital opening apparently not terminal. The whole apparatus is very large, and at rest the anchor-like tip regularly protrudes behind somewhat. In the more primitive *simplex* the genitalia are carried quite concealed, and in Kellogg's fig. of the ♂ of his species the same feature is observable. Snodgrass, however, discussing *taurus* (*op. cit.* p. 118), describes the tip of the penis as "projecting a little beyond the end of the tergum." It is difficult to know whether to follow the figure or the text. Possibly two forms were present in the material.

We use *taurus* for the large form got constantly on *Diomedea exulans*. Our measurements agree best with Taschenberg's. Piaget's seem too small.

iv. The *Eurymetopus* figured by Mjöberg (*loc. cit.*) can be told at once by the parallel-sided basal plate, the extremely small base of the mesosome, the large head and much reduced neck.

Though they can serve only a transient purpose, the following notes on the ♂ ♂ of these four forms are offered. The ♀ ♀ can best be separated by their size (see p. 302).

Description of E. SIMPLEX, spec. nov.

♂. *Head.* Clypeus slightly rounded in front but with distinct lateral angles. Signature reaching the edge of clypeus, its surface anteriorly with parallel furrows. Anteriorly the sides of the shield-shaped signature are concave. The apex of signature posteriorly considerably produced. Below at edge exactly of signature one hair on each side. Two hairs at anterior angle of clypeus, one at end of band, and the other midway thence to edge of signature, one hair below near end of clypeal band. One hair at edge midway to suture. No sutural hair. Suture slanted forward to lateral angle of signature, its posterior margin very clearly defined by inner branch of antennal band. This branch sharply bent back at level of lateral angle of the signature. One post-antennal hair from below and the usual dorsal hair at angle of trabecula with head. One short spine between basal trabecular hair and the point of the signature.

FIG. 2.—E. SIMPLEX.

Trabecula long, not reaching quite to the end of the 1st antennal joint. Above the insertion of the 1st joint 1 moderate bristle. First antennal joint moderately long. Short dorsal spine near base and 2 strong dorsal hairs placed distally in the middle line. One very strong antero-ventral distal hair, which sometimes appears to come from the apex of the trabecula. Second joint extremely long, 1 short dorsal hair near base. Joint medianly constricted somewhat and then distally expanded. Third joint short—1 dorsal hair. Fourth joint very short, not inset into the 3rd, but rising freely from its distal surface. Fifth joint long with 6–7 terminal bristles. Ocular band distinct. Eye moderate, prominent rounded, with spine.

Below the eye 1 spine, posterior angle of temple with 2 short spines. Between these and the eye 15 hairs in 2 rows—7 strong at the edge and 7–8 weaker on the dorsal surface of the head at a short distance from edge and parallel with it.

Occiput markedly re-entrant and medianly swollen. Occipital

margin slightly incrassated. Bands stretching forward indefinitely to ocular bands. Near and between the occipital bands at the level of the hypopharynx, 2 stronger hairs and 2 minute hairs on each side. One short hair base of occipital band. One short hair between ocular spot and posterior incurved end of antennal band.

Thorax. Prothorax. One or two locking bristles below occiput. Two hairs at postero-lateral angle.

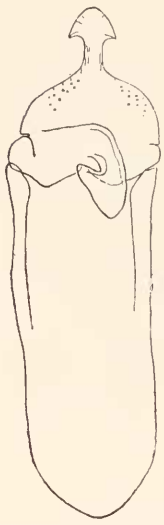


Fig. 3.—E. taurus.

Metathorax. Expanded at the sides posteriorly. Posterior margin straight till near postero-lateral angle where it curves back making a hooked corner, across which is a row of 7 long hairs (4 before and 3 behind the angle), one spine (short) anteriorly in front of the row of long hairs.

On the metasternum are two long straight chitinous incrassations.

Metathorax pointed over abdomen.

Abdomen.—Band in two spots on segment 1, on others entire. Chaetotaxy as follows (Tergites only detailed):—

	1	2	3	4	5	6	7
Lateral angle	1	2	2	2	2	2	4
Post-median	6	7	7	6	5	2	2
Lateral angle	1	2	2	2	2	2	4

The 8th segment not definitely separated from 9th by sutures. Eighth tergite with 4 hairs at postero-lateral angle. The 9th tergite triangular with the apex distinctly bilobed. On each lateral edge 6 hairs.

Ninth sternite underlapping greatly—its posterior edge slightly concave merely—almost straight. On the under surface bearing numerous long hairs, of which about 18 appear at or beyond the edge on each side.

The arrow-shaped "penis" has a short, thick neck and a triangular head not evenly rounded apically.

In the ♀ the 1st, 2nd, and 3rd joints of the antennae are considerably shorter than in the ♂.

The bands of the hind region of the head differ also. In the ♂ the occipital bands run indefinitely from the occipital spot towards the eye. In the ♀ a narrow band commences at each of the posterior temporal angles. It runs slightly inwards but at the level of the occipital spot is still almost at the edge. A little farther in the two narrow bands form an extremely broad connection, from the

anterior angles of which issue two well-marked bands which sweep forward, coming to the edge of the head at the base of the 1st antennal joint and thence continuing merged with the antennals to the suture.

Measurements of E. SIMPLEX.

		♂		♀	
		Length.	Breadth.	Length.	Breadth.
Head		·828	·914	·942	1·028
Prothorax		·285	·571	·357	·685
Metathorax		·371	·742	·435	·871
Abdomen		1·342	—	1·685	—
Segment 4		—	1·028	—	1·400
	Total	2·828	—	3·42	—
Antennae	1	·140	·086	·100	·083
	2	·196	·046	·133	·043
	3	·093	·053	·066	·050
	4	·056	·040	·050	·043
	5	·066	·026	·063	·033

3 adult and 1 nearly adult ♂ ♂, 5 ♀ ♀, 11 (?) imm. *Diomedea melanophrys* (Mollymawk).

♂. *Majaqueus aequinoctialis* (Cape Hen). 1901. Bonomi, coll.

EURYMETOPUS TAURUS, N.

Eurymetopus taurus, Nitzsch, in Giebel, Zeitschr. f. ges. Naturiv. vol. xxviii. p. 385 (1866).

Diomedea sp.? Tristan d'Acunha, 1904. P. Bonomi, coll.

The following from *Diomedea exulans*:—

(*a*) 2 ♂ ♂, ♀, 5 imm. Inaccessible Island (Tristan d'Acunha), 1904. P. Bonomi, coll.

(*b*) 9 ♂ ♂, 21 ♀ ♀, 51 imm.

(*c*) 3 ♀ ♀, 6 imm.

(*d*) ♂, 2 ♀ ♀, 6 imm.

(*b–d* were sent from separate hosts 1912–1913.)

4 ♂ ♂, ♀, 6 imm. *Thalassogeron chlororrhynchus* (Yellow-billed Albatross). Inaccessible Island, 1904.

♂, and imm. *Majaqueus aequinoctialis* (Cape Hen). 1901. Bonomi, coll.

Family LIPEURIDAE.

Gen. LIPEURUS, Nitzsch.

Lipeurus, Nitzsch, in Germar's Mag. f. Insekt. vol. 3, p. 292 (1818).

Lipeurus acutifrons, Rudow (1870). (Pl. XXV., fig. 1.)

L. acutifrons, Rudow, Zeitsch. f. d. ges. nat. xxxvi. p. 138 (1870).

♂, ♀. *Phalacrocorax capensis* (Trek Duiker). Table Bay, 1913.

♂, 4 ♀ ♀, 4 imm. *Phalacrocorax capensis.*

This is the true host.

2 ♂ ♂, 2 ♀ ♀. *Sula capensis.*

♂ and ♀. *Larus hartlaubi.*

2 ♂ ♂. "Probably ex porcupine."

All the above, we believe, came from the cormorant. It is noteworthy that the parasites of *Sula capensis* and *Phalacrocorax capensis* (*L. pullatus*, *M. pustulosum L. acutifrons*, *M. brevipalpe*) have been completely mixed (see records). This probably took place in collecting the hosts. A similar explanation will apply to the *Larus hartlaubi* record. As for the occurrence of *L. acutifrons* on the porcupine, contact in the laboratory may account for it, or more likely two lots were inadvertently put into one tube. We do not think any real "straggling" is to be inferred.

We go back to Rudow's name for the distinct species of *Lipeurus* infesting *Phalacrocorax capensis*. Perhaps this decision requires justification, as many workers will probably be of opinion that not a few (some will say most) of Rudow's names are too vaguely defined for recognition. Personally we are quite opposed to dealing with an author's descriptions *en bloc* or according to any one principle. A description deemed sufficient at one stage of the study of a group may be quite inadequate later. To reject a name because of its "insufficiency" would destroy much of the historical continuity of the study of the *Mallophaga* besides producing periodical outcrops of new names. No one, of course, would plead that the same leniency should be shown to Rudow as is extended to founders like Nitzsch and Denny, whose work was accomplished with instruments inferior to those that every student now commands. Granted that Rudow's text is often unrecognizable *per se*, there may yet be no reasonable doubt as to the insect to which his names refer. Not to go beyond the genus *Lipeurus*—any one who has examined series of the ruddy "*jejunus*" type found on *Somateria mollissima* will not hesitate to use for this form "*rubromaculatus*, Rudow." On the other hand, in the case of a name like *L. nigricans*,

(*Procellaria mollis*), where the host may be expected to harbour regularly more than one *Lipeurus* form, it would be rash to quote Rudow's authority. The final appeal must doubtless be to the type, but one is supposing for the nonce that this is impracticable. We briefly state our reasons for retaining "*acutifrons*."

1. There appears to be great variety in the series of *Lipeurus* infesting cormorants, duikers, etc. It seems reasonable to expect that each host species has a fairly constant parasite in attendance. "Straggling" may of course occur, but we have examined several cormorants (*P. carbo*) and an immense number of shags (*P. graculus*) without finding their *Lipeurus* species mixed.

2. This material is from the same host as "*acutifrons*."

3. The clypeus of these ♀ examples is angled more sharply than in other species we have seen. This may well have suggested the name.

4. Unless we use "*acutifrons*" the synonymy of the group will be further burdened. Dr. Péringuey's gatherings correspond very closely to the species Piaget figures as *gyricornis*, Denny. At first we were inclined to quote them as "*gyricornis*, var.," but on going into the matter we are far from being satisfied that Piaget was right in identifying his material from *Sula australis* (Muséum de Leide) with Denny's species. Piaget remarks (Les Pédiculines, pp. 338–339): "Denny a rencontré un mâle sur une *Sterna hirundo;* malgré ce qu'il y a d'incomplet dans sa description, je n'hésite pas à adopter le nom qu'il a choisi pour l'espèce qui vient d'être caractérisée." The grounds for this confidence seem slender indeed. Nor is it certain that *Sula australis* is the genuine host of the insect Piaget had under consideration. His figure indicates a true *Phalacrocorax* parasite. If Piaget, then, had not the real "*gyricornis*, D," before him, and if "*acutifrons*" is rejected, we should have possibly two unnamed species to deal with. Are we to erect two new names because of this uncertainty? It seems better to adopt Rudow's designation for the *Lipeurus* of *Phalacrocorax capensis*, and to leave unsettled the identity of Piaget's insect, which may be a var. of *acutifrons* or a good species.

Lipeurus afer, Kellogg (1908).

L. afer, Kellogg, Results Sjöstedts Kilimandjaro-meru Expedition 15 : 4. Mallophaga, p. 47, pl. vii. fig. 5, Upsala (1908).

6 ♂♂, 27 ♀♀, 7 imm. *Phalacrocorax africanus*. Table Bay, 1913.

In 1880 Piaget (Les Pédiculines, p. 337) arbitrarily set aside Denny's name *brevicornis*, given (Monogr. Anopl. Brit. p. 181,

pl. xiii. fig. 8, 1842) to the *Lipeurus* of the shag [*Phalacrocorax graculus* (*cristatus*)] and applied the same designation to specimens of this genus taken "Sur un *Carbo sulcirostris* de Célèbes (Muséum de Leide). Sur un *C. africanus* de Dembea (ibid.) la femelle n'avait de taches transverses ni sur le dos, ni sur le ventre." The absence of the transverse markings on the tergites indicates immaturity merely, and is of no systematic value. Apart from using a pre-occupied name, we think it almost certain that Piaget had before him two different species when he drew up his account of *brevicornis*. We know at any rate now that *C. africanus* has a *Lipeurus* of its own which is distinct from the species Piaget has described. It is possible that Piaget's ♀ from *C. africanus* was a straggler on that host (and this is not improbable, since the example occurred on a Museum skin), but bearing in mind the general resemblance to one another of the ♀ ♀ of this group of *Lipeurus* it is simpler to suppose that Piaget judged two forms to be one. This would be all the easier since the example in question was immature. In dealing with *Lipeurus* from *Phalacrocorax* (*Carbo*) it is inadvisable, in our opinion, to assimilate forms from separate host species unless one has been able to examine critically the ♂ in both instances.

In 1908 Kellogg, quite justifiably, therefore erected the species *afer* for the *Lipeurus* of *P. africanus*, Natron Lakes, Kilimandjaro-meru (Sjöstedt leg.). In introducing this new form Kellogg, who assuredly had not overlooked Piaget's *brevicornis*, remarks: "The new species is quite distinct from any form heretofore recorded, *especially in the characters of the male*." (The italics are ours.)

Before becoming convinced of the great diversity of species in the series of *Lipeurus* found on *Phalacrocorax*, another possibility had occurred to us, viz., that Piaget might unconsciously have used *brevicornis* in Denny's sense. Though this is not the case, it is curious that true *brevicornis*, D., should come so close as it does to *afer*, Kellogg. The two are, however, abundantly distinct. The genitalia of *afer* are extremely delicate, indeed without dissection their presence is hard to demonstrate.

It should be added that Bagnall and Hall (Journ. Econ. Brol. vii, No. 1, p 9, Feb., 1912), on the ground that *brevicornis* is pre-occupied, propose to substitute *confusus* for Piaget's name. This name too, we think, should be rejected, as it is still held to apply to a *Lipeurus* from *C. sulcirostris* and *C. africanus*.

We have then (*a*) *L. brevicornis*, D., from *P. graculus*, (*b*) *L. afer*, Kellogg, from *P. africanus*, and (*c*) a third species unnamed from *P. sulcirostris*. It would be easy to propose a new name for the last

but this is inadvisable without a nearer acquaintance with the insect in question. It is doubtful, moreover, whether *P. sulcirostris* is the true host since Piaget had already (Les Pédiculines, p. 335, pl. xxvii. fig. 4, 1880) described a *L. setosus* from the same cormorant. The hosts were in both cases Museum skins. One is left really only Piaget's description and figures. The whole matter of rebaptism had better be dealt with by some one who has access to Piaget's types, and who at the same time possesses fresh material from the original host.

Lipeurus baculus, N. (1818).

Lipeurus baculus, Nitzsch, in Giebel, Ins. Epiz. p. 215, pl. xvi. figs. 8, 9, pl. xx. fig. 3 (1874).

2 imm. ♀ ♀. *Vinago delalandi.* Port St. Johns, Cape Col., Nov., 1901. Shortridge.

3 ♂ ♂, 24 ♀ ♀, 6 imm. From unknown host. 1912.

A cosmopolitan parasite of pigeons. The immature stage is, we think, the *Nirmus claviformis* described by Denny, Monogr. Anopl. Brit. p. 131, pl. ix. f. 7 (1842).

Lipeurus confidens, Kellogg (1899).

Lipeurus confidens, Kellogg, New Mallophaga, pt. iii. p. 26, pl. iii. fig. 1 (1899).

♀. *Diomedea exulans* (Wandering Albatross).

♀. *Diomedea melanophrys* (Black-browed Albatross).

♀. *Thalassogeron chlororrhynchus* (Yellow-billed Albatross). Inaccessible Is. 1904.

These agree with Kellogg's description save that they are somewhat smaller. They are probably not quite mature. We have noticed in several species of Albatross *Lipeuri* that the nearly adult ♀ ♀ show a sharp demarcation between the 7th and the 8th and 9th segments. The last two are small, but they broaden and lengthen simultaneously with the appearance of fully formed ova.

Lipeurus tricolor, Piaget (1880).

Lipeurus tricolor, Piaget, Les Pédiculines, p. 363, pl. xxx. fig. 4 (1880).

5 ♂ ♂, 2 ♀ ♀, 5 imm. *Phoebetria fulginosa.*

Doubtfully distinct from the preceding. Piaget's description attributes a naked metathorax to this insect—an unlikely condition in any species of *Lipeurus*. Piaget's figure also shows broad

median blotches on the abdomen. It is by these characters mainly that Kellogg separates his *confidens* from *tricolor*. In *confidens*, while there are no blotches on the abdominal tergites, such marks appear on the sternites. These may not show on normally preserved opaque examples but when specimens have been macerated or dried the marks on the under side of the abdomen shine through. The above material from Sooty Albatross is in a bad state of preservation and agrees exactly with Piaget's illustration of *tricolor*, but a little care in focusing shows that the blotches seen are on the sternites.

Piaget's types taken from Museum skins were probably in a similar state and a little rough handling would account for the occiput being "nu." On the chief remaining difference between *tricolor* and *confidens*—length—one cannot venture much. We have not sufficiently good material of the species before us on which to base an opinion.

Lipeurus diversus, Kellogg (1896).

Lipeurus diversus, Kellogg, New Mallophaga, i. p. 123, pl. viii. figs. 3, 4 (1896).

2 ♂ ♂, 4 ♀ ♀, imm. *Oceanites oceanicus* (Wilson's Storm Petrel). 26 : iii : 04. P. Bonomi leg.

♀. *Majaqueus aequinoctialis* (Cape Hen). 1901. Bonomi, coll.

At first we had referred these examples to *L. angusticeps*, Piaget (Les Pédiculines, p. 306, pl. xxv. fig. 4, 1880), but on reconsidering them, we find that from their dimensions they agree better with *L. diversus*, Kellogg. How the two forms are related it is hard to say. As Kellogg points out, there are conspicuous differences in the measurements, but we should not care to lay great stress on the additional features adduced. Kellogg states that in a ♂ *diversus* the posterior border of the signature is angularly concave not straight as in *angusticeps*. One of the above ♂ ♂ shows this outline, in the other the line is nearly convex. In *diversus* there are two short temporal hairs which appear also in the S.A. Museum specimens, but in some cases one or other is broken off. Piaget describes *angusticeps* as having one temporal hair, but the example he described may not have been perfect. In *diversus* the inturned antennal bands are continuous with the bands bordering the oral fossa. Now it is true that Piaget says of *angusticeps*, "Les antennals très prononcées s'arrêtant au clypeus," but he adds immediately, "Les deux bandes internes ne s'arretent pas à la

hauteur de la fossette ;" and if one looks at fig. 4. pl. xxv., it is apparent that the antennals and the bands bordering the fossa are continuous save for one clear spot. We are of opinion that a closer examination of Piaget's types will show that the band is only apparently interrupted, what happens really in these petrel *Lipeuri* is that the band may be quite uncoloured in this region. The intensity of the coloration is probably a matter of age.

As regards the chaetotaxy of the postero-lateral angles of the metathorax *diversus* has 5 pustulated hairs. If *angusticeps* has in fact only 2 in that position it must be a very anomalous form. It must be borne in mind that Piaget's types were from Museum skins, which would not conduce to the preservation intact of many hairs, weaker spines, etc. For the same reason also the correct outline of the segments may have been lost.

Lipeurus densus, Kellogg (1896).

Lipeurus densus, Kellogg, New Mallophaga, pt. i. p. 114, pl. vii. figs. 1–2 (1896).

From *Diomedea exulans*—

(*a*) 3 imm. examples.

(*b*) imm. and 4 other indeterminable imm. specimens.

In both cases occurring with *L. ferox*, Giebel, of which, at first, we took this form to be the immature stage. Kellogg's ♀ type was not full grown, but later he described the adult ♂.

Lipeurus ferox, Giebel (1874).

Lipeurus ferox, Giebel, Ins. Epiz. p. 235 (1874).

From *Diomedea exulans* (Wandering Albatross)—

(*a*) ♂. Bonomi (?), received 1912, ♂ and ♀ received 1912.

(*b*) ♂. Tristan d'Acunha, 1904. P. Bonomi, coll.

(*c*) 5 ♀ ♀. Spring, 1913.

Lipeurus fuliginosus, Taschenberg (1882).

Lipeurus fuliginosus, Taschenberg, Die. Mallophaga, in Nova Acta Leop-Carol. Deutsche Akad. d. Naturf. vol. xliv. p. 156, pl. iv. fig. 3 (1882).

♂. *Diomedea melanophrys* (Mollymawk).

♀. *Diomedea exulans.*

3 ♀ ♀. *Oceanites oceanicus* (Wilson's Storm Petrel). 26 : iii : 04. P. Bonomi, coll.

♂, 3 ♀ ♀. *Majaqueus aequinoctialis* (Cape Hen). 1901. Bonomi, coll.

Lipeurus longicornis, Piaget (1880).

Lipeurus longicornis, Piaget, Les Pédiculines, p. 334, pl. xxvii. fig. 3 (1880).

5 ♂♂, 3 ♀♀, 40 imm. *Phalacrocorax lucidus* (White-breasted Duiker).

Lipeurus pullatus, N. (1818).

Lipeurus pullatus, Nitzsch, in Giebel, Ins. Epiz., p. 236 (1874).

From *Sula capensis* (Malagash)—

(*a*) 203 ♂♂, 292 ♀♀, 154 imm. 1912.

(*b*) 6 ♂♂, 6 ♀♀, 23 imm. Cape Town, 1912.

(*c*) 11 ♂♂, 24 ♀♀, 56 imm. Received 9 : iv : 13.

4 ♂♂, 7 ♀♀, 9 imm. *Phalacrocorax capensis.*

4 ♂♂, 7 ♀♀. Unknown bird.

We have not overlooked Mjöberg's clearly defined "*Pectinopygus*" (1910) which he proposes as a new genus for this species. But it is our present opinion that the two main characters of this division, viz. the peculiar 3rd joint of the antennae ♂ and the uniquely "pectinated" genitalia ♂ are of specific not generic value. The genitalia ♂ should be used for systematic purposes with great caution, and only when a group of species show a well-marked type of apparatus. Otherwise our classification will be loaded with monotypic genera.

The group embracing the *Lipeuri* of *Sula* we imagine will ultimately prove to be a fairly compact one—whether worthy of generic rank or not future research must decide. We have seen only *L. pullatus*, N. (*Sula bassana*, *S. capensis*) and *L. potens* (*Sula piscatrix*). We do not think that a fair classification will separate these species, but their respective genitalia ♂ are of entirely different types. Interestingly enough the ♀♀ genitalia of these species offer points of resemblance. The organization of the ♀ as a whole seems more stable and primitive.

Lipeurus secretarius, Giebel (1874).

Lipeurus secretarius, Giebel, Ins. Epiz. p. 213 (1874).

From *Serpentarius secretarius* (Secretary Bird). Two lots—

(*a*) 8 ♂♂, 8 ♀♀. Much faded and shrunken.

(*b*) 9 ♀♀ 6 imm. Labelled "*Phoebetria fuliginosa* (Sooty Albatross)"—a clear error.

Lipeurus versicolor, N. (1818).

Lipeurus versicolor, Nitzsch, in Giebel, Ins. Epiz. p. 224, pl. xvi. f. 7 (1874).

3 ♂♂, 4 ♀♀, 2 imm. *Ciconia alba* (White Stork).

Sub-Order AMBLYCERA.

Family GYROPIDAE.

Gen. GLIRICOLA, Mjöb.

Gliricola, Mjöberg, Arkiv. för Zoologi, Band 6, N:o. 13, p. 18 (1910).

Gliricola gracilis, N. (1818).

Gyropus gracilis, Nitzsch, in Giebel, Zeitschr. f. ges. Naturw. vol. xviii. p. 92, pl. ii. figs. 10, 11 (1861).

♀, 10 imm. *Cavia cobaya* (Guinea-pig).

Gen. GYROPUS, Nitzsch.

Gyropus, Nitzsch, in Germar's Mag. f. Insekt. vol. 3, p. 302 (1818).

Gyropus ovalis, N. (1818).

Gyropus ovalis, Nitzsch, in Giebel, Zeitschr. f. ges. Naturw. vol. xviii. p. 89, pl. ii. figs. 1–9 (1861).

5 ♂♂, 6 ♀♀, 21 imm. *Cavia cobaya* (Guinea-pig).

Family MENOPONIDAE.

Gen. MENOPON, Nitzsch.

Menopon, Nitzsch, in Germar's Mag. f. Insekt. vol. 3, p. 299 (1819).

Menopon appendiculatum, Piaget (1880).

Menopon appendiculatum, Piaget (1880).

Menopon appendiculatum, Piaget, Les Pédiculines, pp. 473–474, pl. xxxvi. fig. 8 (1880).

2 ♂♂, 3 ♀♀, 17 imm. Unknown host.

The ♂♂ are scarcely mature, but the genitalia are plainly discernible, leaving one in no doubt as to the sex. In the younger specimen the basal plate alone is chitinized.

We feel fairly confident in quoting Piaget's name for these peculiar examples, although neither in dimensions nor in some details of chaetotaxy and outline do they completely agree with Piaget's description. But on the other hand, there are in the present case discrepancies between the text and the figure of the French author. Piaget remarks as to the host of *appendiculatum*: "Sur une *Perdix* cinerea. Ce parasite, si differente du type qui infeste les perdix me paraît un individu égaré."

It is unfortunate that the host of the above examples was not recorded. We have in our collection three specimens which we cannot separate from these South African examples, viz. :—

1. ♂ and ♀. "Ground Hornbill" (*Bucorvus caffer ?*).
2. ♂. "Eagle from Japan."

These specimens are on two slides, one thirty, the other some fifty years old, and even if the hosts are correctly given on the labels the identity of the real host is still in doubt. It may be the Hornbill or some other ground-frequenting species. It is possible, however, that Dr. Péringuey's examples were taken along with *Lipeurus baculus* from unknown host.

Menopon appendiculatum seems to come closest to the peculiar *Menopon* of Parrots (*Psittacus*, spp.). The posterior femora (2nd and 3rd pairs of legs) bear a postero-ventral row of equal strong, rather short, and somewhat abruptly pointed spines.

Menopon brevipalpe, Piaget (1880).

Menopon brevipalpe, Piaget, Les Pédiculines, p. 498, pl. xl. f. 5 (1880).

♂ ♂, ♀ ♀. *Phalacrocorax capensis* (Trek Duiker). Table Bay, 1913. (*a*) 43 ♂ ♂, 35 ♀ ♀, 45 imm. (*b*) 6 ♂ ♂, 6 ♀ ♀, 12 imm. *Phalacrocorax capensis.*

3 ♀ ♀. *Sula capensis.*

Near the middle of each side of the 9th tergite are a number of strong hairs, the "petite touffe" mentioned in Piaget's description. Just posterior to this and at the side are 3 short strong spines in a row in a very reliable character for this species.

Menopon phaeostomum, N. (1818).

Menopon phaeostomum, Nitzsch, in Giebel, Ins. Epiz. p. 292 (1874).

♂, 7 ♀ ♀ imm. *Pavo cristatus* (Peacock).

Menopon pustulosum, N. (1818).

Menopon pustulosum, Nitzsch, in Giebel, Ins. Epiz. p. 298 (1874).

From *Sula capensis* (Malagash)—

(*a*) 80 ♂ ♂, 60 ♀ ♀, 36 imm.

(*b*) 13 ♂ ♂, 9 ♀ ♀, 10 imm. Received 9 : iv : 13.

2 ♂ ♂, 3 ♀ ♀, 2 imm. *Phalacrocorax capensis.*

Menopon rusticum, Giebel (1874).

Menopon rusticum, Giebel, Ins. Epiz. p. 288 (1874).

♂. *Hirundo rustica.*

Gen. ANCISTRONA, Westwood.

Ancistrona, Westwood, Thes. Ent. Oxon. p. 197 (1874).

Ancistrona procellariae, Westwood (1874).

Ancistrona procellariae, Westwood, Thes, Ent. Oxon. p. 197 (1874).
Adult ♀ and imm. ♀. *Oceanites oceanicus* (Wilson's Storm Petrel).
26 : iii : 04. P. Bonomi leg.

Two species of *Ancistrona* have been described. We have several examples of *A. gigas*, P. (*Fulmarus glacialis*) in our collection, and have seen the types of *A. procellariae* (British Museum collection), but the latter were at the time unmounted. We think Dr. Péringuey's two specimens agree best with *procellariae*. But it is not certain that there are two really distinct species.

Gen. COLPOCEPHALUM, Nitzsch.

Colpocephalum, Nitzsch, in Germar's Mag. f. Insekt. vol. 3, p. 298 (1818).

Colpocephalum cuculare, G. (1874).

Colpocephalum cuculare, Giebel, Ins. Epiz. p. 264 (1874).
From *Serpentarius secretarius*—
(*a*) 2 ♀ ♀.
(*b*) 305 ♂ ♂, 453 ♀ ♀, 328 imm.

This, Piaget thinks, is only a variety of *C. candatum*, G. We have had no opportunity of comparing the genitalia of the two forms.

Colpocephalum pingue, Kellogg (1896).

Colpocephalum pingue, Kellogg, New Mallophaga, i. pp. 144–5, pl. xii. fig. 5 (1896).
3 ♀ ♀, 2 imm. *Diomedea exulans* (Albatross).

Colpocephalum subpachygaster, Piaget (1880).

Colpocephalum subpachygaster, Piaget, Les Pédiculines, p. 517, pl. xliii. fig. 2 (1880).
♂, 2 ♀ ♀, imm. *Bubo capensis*.
26 imm. *Eutolmaëtus spilogaster* (Hawk Eagle).
5 ♂ ♂, 19 ♀ ♀, 25 imm. *Buteo jakal*. 9 : iv : 13.

Colpocephalum umbrinum, Piaget (1880).

Colpocephalum umbrinum, Piaget, Les Pédiculines, p. 556, pl. xlvi. fig. 6 (1880).
♀. *Tringa subarquata*.

In the abdominal chaetotaxy this species shows sexual dimorphism

(cf. *C. grandiceps*, Piaget, and *C. bicolor*, Piaget). In the ♂ there is *one* posterior row of long pustulated hairs on the tergites. Anterior to this row are numerous short pustulated hairs (the pustules being very small) clothing the surface of the tergite. In the ♀ each tergite bears *two* transverse rows of strong pustulated hairs without any smaller ones. Hence if one is dealing with a ♀ error is liable to arise at No. 29 of Piaget's dichotomic table, p. 513, Les Pédiculines.

COLPOCEPHALUM ZEBRA, N.

Colpocephalum zebra, Nitzsch, in Giebel, Ins. Epiz. p. 271, pl. xiii. fig. 6 (1874).

4 ♂ ♂, ♀. *Ciconia alba* (White Stork).

FAMILY LAEMOBOTHRIIDAE.

GEN. LAEMOBOTHRIUM, Nitzsch.

Laemobothrium, Nitzsch, in Germar's Mag. f. Insekt. vol. 3, p. 301 (1818).

LAEMOBOTHRIUM LATICOLLE, N. (1818).

Laemobothrium laticolle, Nitzsch, in Giebel, Ins. Epiz. p. 252 (1874).

4 ♂ ♂, imm. *Falco subbuteo* (Hobby).

In the foregoing pages Nitzsch's species have been dated only when they appear in the classical list in Germar's Magazine, 1818.

LIST OF HOSTS AND PARASITES.

I. MAMMALIA.

HOMO SAPIENS.

Echidnophaga gallinaceus, Westw.
Ctenocephalus felis, Bouché.

CANIS FAMILIARIS.

E. gallinaceus, Westw.
Linognathus piliferus, Burm.

Proteles cristatus.

Pulex irritans, L.

Otomys brantsi luteolus.

("Field-mouse.")

P. irritans, L.

Polyplax otomydis, Cummings.

"Porcupine."

Dinopsyllus ingens, Rothsch.

Orycteropus capensis.

Echidnophaga larina, Rothsch.

Hybophthirius notophallus, Neum.

Cavia cobaya.

E. gallinaceus, Westw.

Gliricola gracilis, N.

Gyropus ovalis, N.

Antilope euchore.

Linognathus tibialis, P., var. nov. *euchore.*

Cephalophus monticola.

E. gallinaceus, Westw.

Ctenocephalus canis, Curt.

C. felis, Bouché.

II. AVES.

Eutolmaetus pennatus.

Nirmus vittatus, G.

Eutolmaëtus spilogaster.

N. vittatus, G.

Colpocephalum subpachygaster, P.

Serpentarius secretarius.

Lipeurus secretarius, G.

Colpocephalum cuculare, G.

Buteo jakal.

Docophorus leucogaster, G.

N. vittatus, G.

C. subpachygaster, P.

Melierax canorus.

N. vittatus, G.

Falco subbuteo.

Laemobothrium laticolle, N.

Circus macrurus.	
	N. rittatus, G.
Strix flammea.	
	E. gallinaceus, Westw.
Bubo capensis.	
	Docophorus cursor, N.
	D. rostratus, N.
	C. subpachygaster, P.
Bubo maculosus.	
	D. cursor, N.
Corvus capensis.	
	Nirmus varius, N.
Sturnus vulgaris.	
	Nirmus nebulosus, N.
Passer arcuatus.	
	Nirmus vulgatus, Kell. and Chap.
Amadina erythrocephala.	
	Nirmus vulgatus, Kell. and Chap.
Hirundo rustica.	
	Docophorus excisus, N.
	Nirmus gracilis, N.
	Menopon rusticum, N.
Merops apiaster.	
	Docophorus bifrons, N.
Upupa africanus.	
	Nirmus melanophrys, N.
Turtur capicola.	
	Goniodes minor, P.
Vinago delalandi.	
	Goniodes minor, P.
	Lipeurus baculus, N.
"Fowls."	
	E. gallinaceus, Westw.
Pavo cristatus.	
	Goniodes falcicornis, N.
	Menopon phaeostomum, N.
Tringa subarquata.	
	Docophorus lari, D.
	Nirmus actophilus, Kell. and Chap.
	N. zonarius, N.
	Colpocephalum umbrinum, P.

AVOCETTA RECURVIROSTRA.

Nirmus decipiens, N.
N. pileus, N.
N. signatus, P.

AEGIALITIS MARGINATA.

Docophorus cordiceps, P., var. *semivittatus*, G.
Nirmus macrocephalus, sp. nov.

AEGIALITIS PECUARIA.

D. cordiceps semivittatus, G.
N. macrocephalus, nov. sp.

AEGIALITIS TRICOLLARIS.

D. cordiceps semivittatus, G.
N. macrocephalus, nov. sp.

CICONIA ALBA.

Lipeurus versicolor, N.
Colpocephalum zebra, N.

PROCELLARIA GIGANTEA.

Mackayia heteracanthus, Waterst.

OCEANITES OCEANICUS.

M. heteracanthus, Waterst.
Lipeurus diversus, Kell.
Lipeurus fulginosus, Taschb.
Ancistrona procellariae, Westw.

MAJAQUEUS AEQUINOCTIALIS

Giebelia hexakon, sp. nov.
Eurymetopus simplex, sp. nov.
E. taurus, N.
Lipeurus diversus, Kell.
Lipeurus fulginosus, Taschb.

DIOMEDEA EXULANS.

E. taurus, N.
Lipeurus confidens, Kell.
Lipeurus densus, Kell.
Lipeurus ferox, G.
Lipeurus fuliginosus, Taschb.
Colpocephalum pingue, Kell.

PHOEBETRIA FULIGINOSA.

Lipeurus tricolor, P.

DIOMEDEA MELANOPHRYS.

D. lari, D.
E. simplex, sp. nov.
L. confidens, Kell.
L. fuliginosus, Taschb.

THALASSOGERON CHLORORRHYNCHUS.

E. taurus, N.
L. confidens, Kell.

LARUS DOMINICANUS.

D. lari, D.

LARUS HARTLAUBI.

D. lari, D.
Nirmus punctatus, N., var. nov. *lingulatus*.
Lipeurus acutifrons, Rud.

STERNA BERGII.

Docophorus melanocephalus, N.

SULA CAPENSIS and PHALACROCORAX CAPENSIS.

Lipeurus pullatus, N.
Menopon pustulosum, N.
Lipeurus acutifrons, Rud.
Menopon brevipalpe, P.

PHALACROCORAX AFRICANUS.

Lipeurus afer, Kell.

PHALACROCORAX LUCIDUS.

Lipeurus longicornis, P.

SPHENISCUS DEMERSUS.

Goniocotes bifasciatus, P.

III. UNKNOWN HOSTS.

Nirmus varius, N.
Lipeurus baculus, N.
Menopon appendiculatum, P.
Lipeurus pullatus, N.

THE MANSE, OLLABERRY, SHETLAND.
February, 1914.

LIST OF ILLUSTRATIONS.

Text-figure 1, p. 276. *Linognathus tibialis*, P., var. *euchore* (drawn from slide).
,, 2, p. 303. Genitalia of *Eurymetopus simplex*, n. sp. ♂.
,, 3, p. 304. ,, ,, *taurus*, N. ♂.
(This is the "*taurus*" of Taschenberg's monograph but possibly not the "*taurus*" of Piaget's *Essai*.)

Plate XXV.

Fig.
1. Genitalia of *Lipeurus acutifrons*, Rudow. Basal plate not entirely shown.
2. ,, *Nirmus macrocephalus*, n. sp.
3. ,, ,, *hiaticulae*, D.
4. ,, ,, *opacus*, Kell. and Chap.
5. Head of *Nirmus macrocephalus*, n. sp.
6. ,, ,, *opacus*, Kell and Chap.
7. Antenna of *Giebelia hexakon*, n. sp.
8. Paramer of *Mackayia heteracanthus*, Waterst.
9. ,, *Giebelia mirabilis*, Kell.
10. ,, *Mackayia dimorpha*, Waterst.
11. ,, *Giebelia hexakon*, n. sp.

Plate XXVI.

12. Lateral band of *Mackayia dimorpha*, Waterst. ♀. (a_1) seg. 3, (b) seg. 7.
13. ,, ,, *heteracanthus*, ,, ,, ,, ,,
14. ,, *Giebelia hexakon*, ,, ,, ,, ,,
15. ,, ,, *mirabilis*, Kell.
16. Genitalia of *Mackayia heteracanthus*, Waterst. ♂.
    a. Anterior and posterior head spines of *M. heteracanthus*, Waterst. ♂.
    b. Endomer (?) of *M. heteracanthus*, Waterst. ♂.
17. Antenna of *Giebelia mirabilis*, Kell.
18. ,, *Mackayia heteracanthus*, Waterst. ♂.
19. ,, ,, *dimorpha*, Waterst. ♂.